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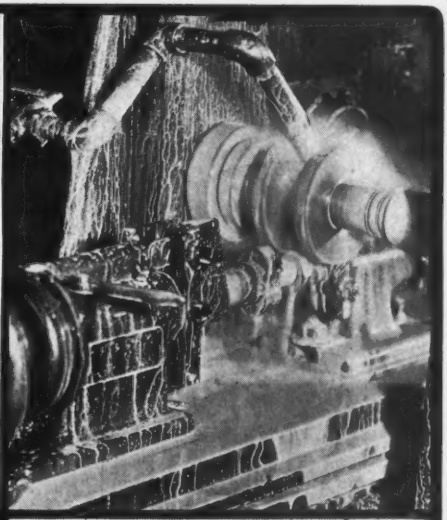

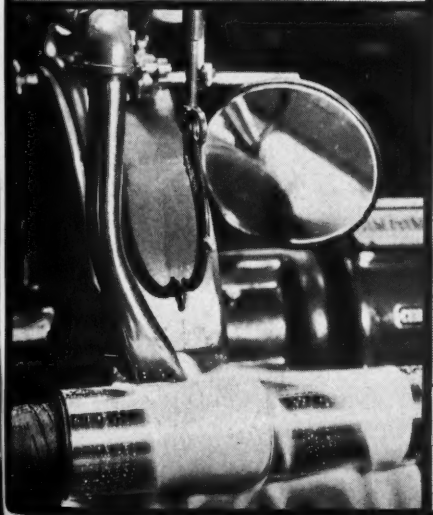

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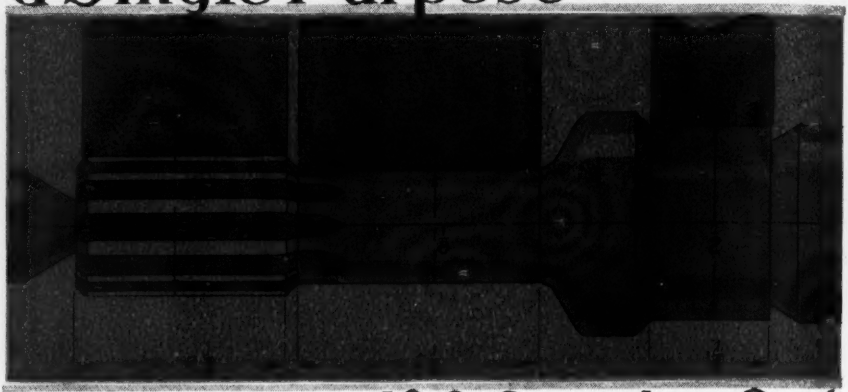

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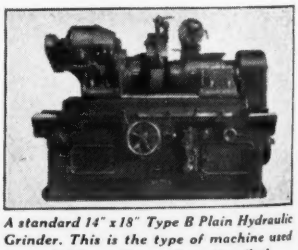

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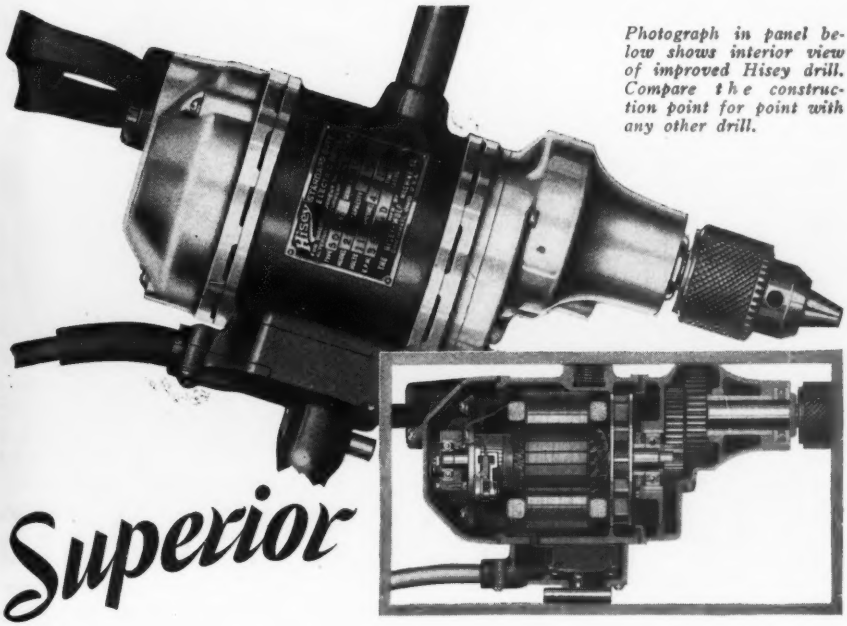

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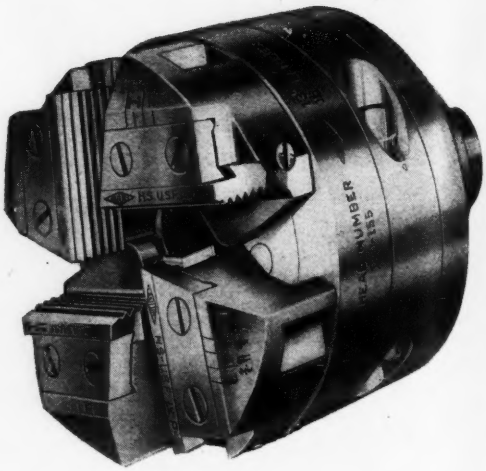

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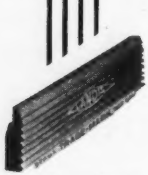

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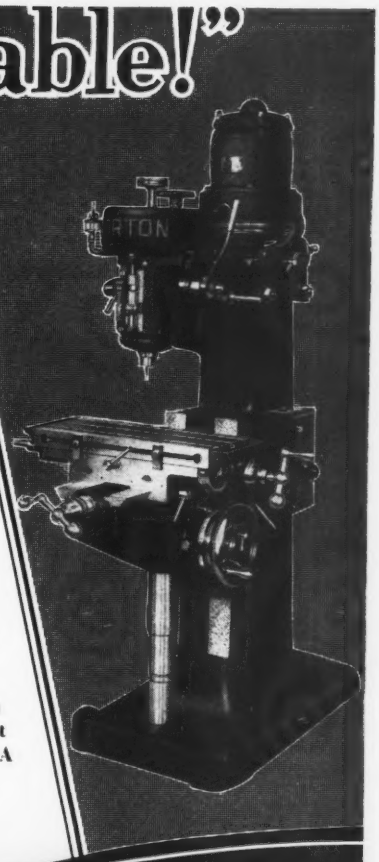

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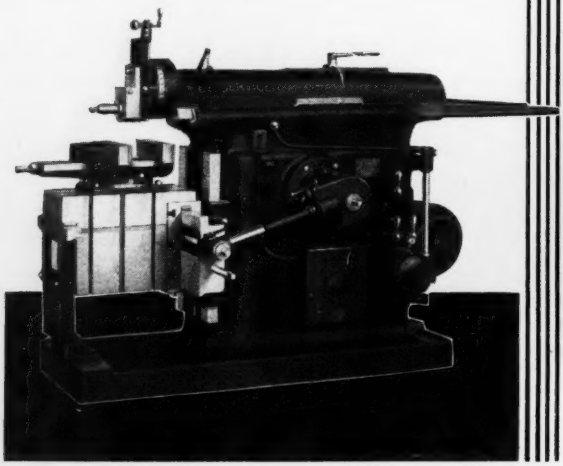

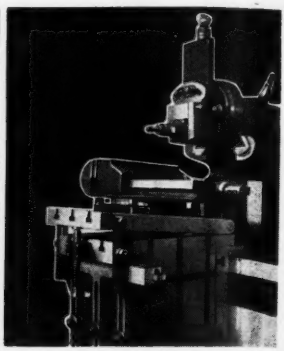

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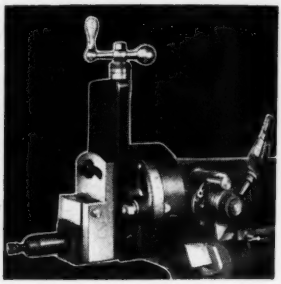

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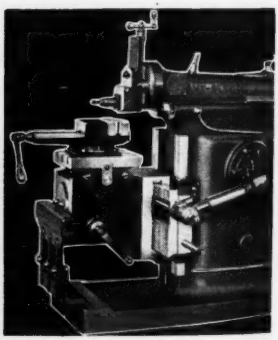

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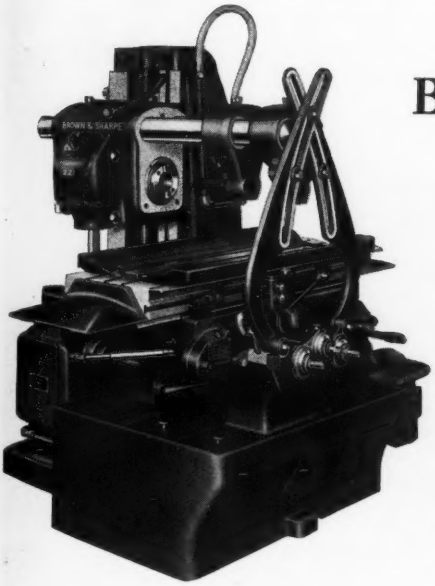

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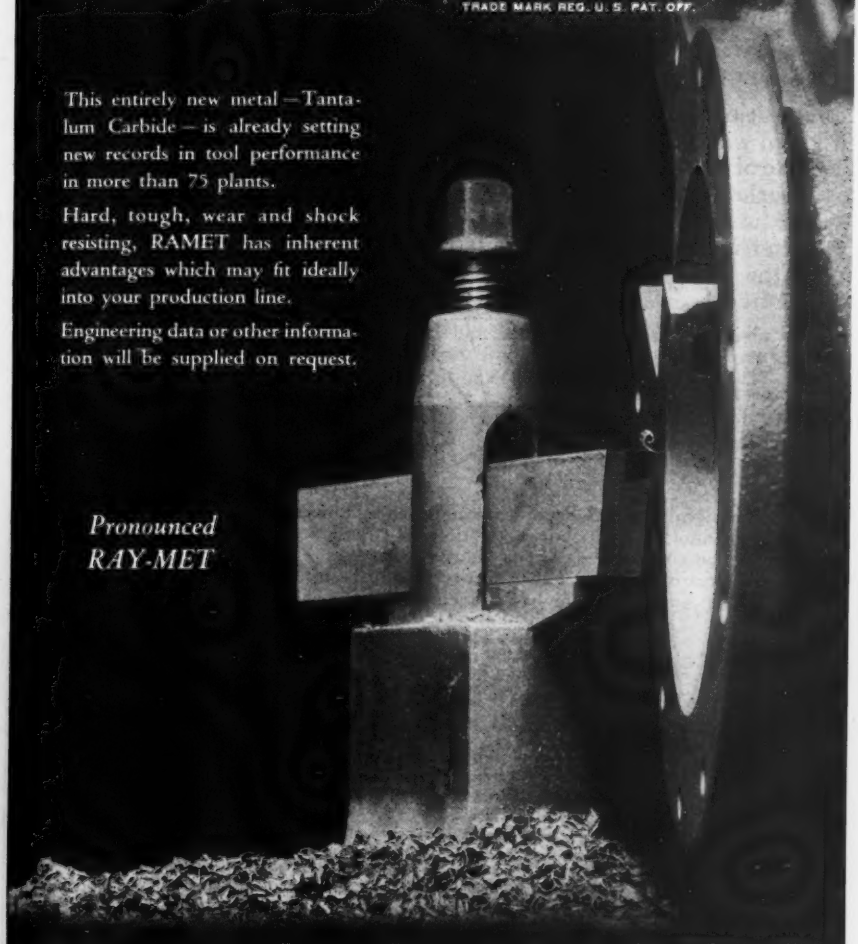

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MODERN Machine Shop

A Magazine for Machine Shop Executives
HOWARD CAMPBELL, Editor

Vol. 3 MAY, 1931 No. 12

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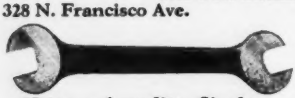

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MODERN Machine Shop

MAY, 1931

CINCINNATI, OHIO VOL. 3, NO. 12

Machining Parts for "Wasp" and "Hornet" Engines

A discussion of the tools and methods used by the Pratt & Whitney Aircraft Company in the production of these well-known airplane engines.

By HOWARD CAMPBELL

THE "Wasp," "Wasp Junior," and "Hornet" airplane engines, built by the Pratt & Whitney Aircraft Company, Hartford, Conn., are of the high-powered, air-cooled type, and were designed by engineers of more than thirteen years' experience in the designing and building of aircraft engines. The engines are supplied in either the direct drive or geared model; in the geared type, however, is incorporated a patented 2 : 1 reduction gear for the "Hornet" and 5 : 4 for the "Wasp," of low weight and extreme durability. The various models are of the same general type of construction, and materials used are of the same quality. In many cases the production methods are identical and 85 per cent of the parts are designed for interchangeability.

Each cylinder is built up of a forged steel barrel and cast aluminum head, with integral valve mechanism housings. The cylinder head is provided with vertical fins which provide the maximum of cooling to the combustion chamber and valves. The integral rocker mechanism housings, which are a patented feature of Pratt & Whitney engines, make pos-

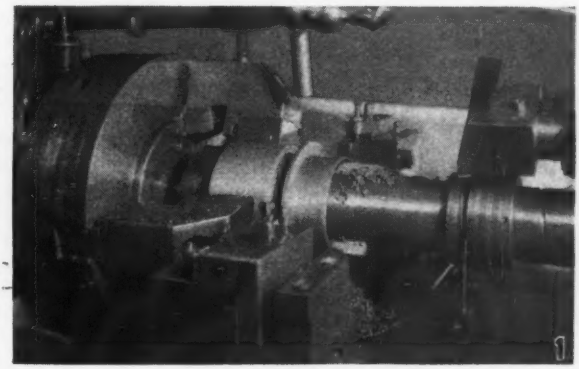
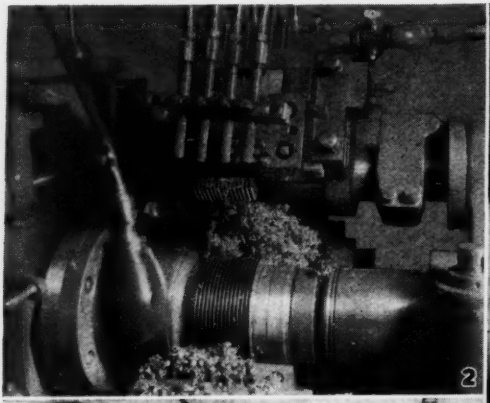


Fig. 1—Machining a forged steel cylinder barrel for a "Wasp" engine



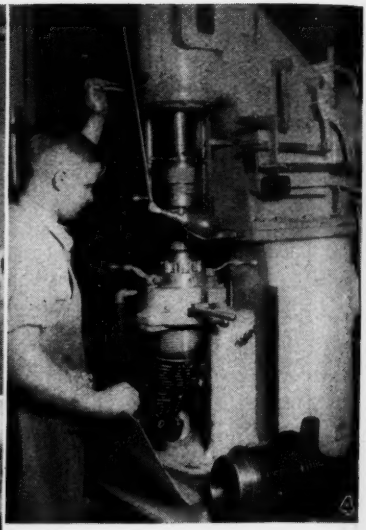
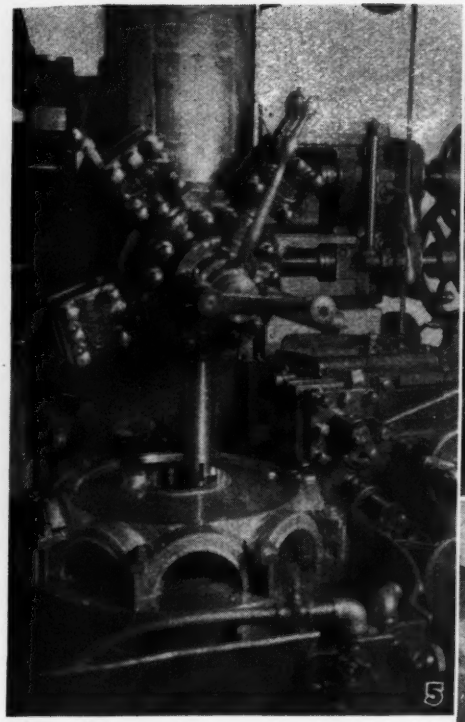


Fig. 2—The "fins" are machined on both sides, using two sets of cutters.
Fig. 3—The bores of the cylinders are ground to size in this machine.
Fig. 4—With this Barnes honing machine and a nine-stone hone, the wall of the cylinder is given a glass-smooth finish.

sible the complete inclosure of the rocker mechanism in a tight compartment where it is not subject to leaks.

In the first machining operation on the cylinder, the barrel is turned at one end to provide an opportunity for firm chucking in the second operation. In the second operation, the flange is turned and faced on both sides, and the barrel is turned, bored, and reamed in the automatic lathe shown in Fig. 1. Both sides of the flange and the end of the barrel are faced with tools held in the front and rear cross-slide tool-posts. Two boring cuts are taken, the second boring bar, shown in the illustration, carrying a double-end cutter. This tool finishes the diameter of the bore to 5.700 in. for the "Wasp," and the reamer, which follows the finishing bar, reams it to 5.725 in., leaving 0.025 in. of stock to be removed in the grinding operation. This operation is completed in 20 minutes.

Figure 2 shows how the "fins" are cut on the barrel. Here the piece is chucked in a Fay automatic lathe and the fins are machined on both sides by the use of two sets of cutters, held in the front and rear tool blocks. The cutters in one "gang" finish one side of each of the fins, and the cutters in the other set finish the opposite side, reducing the fin to the proper thickness. This operation is completed in from eight to nine minutes.



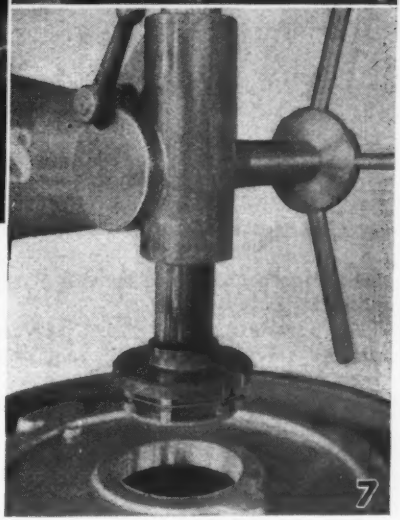


Fig. 5—Boring, facing, and counterboring the front half of a crankcase. Fig. 6—The joint-face is lapped dead smooth in this Norton lapping machine. Fig. 7—Close-up view of expansion arbor by which the crankcase is held in the lapping machine.

In the next operation the bore of the cylinder barrel is ground to a diameter of 5.750 in., plus or minus 0.001 in. The grinding equipment consists of a battery of internal grinding machines similar to that shown in operation in Fig. 3. The barrel is bolted to a ring, which, in turn, fits into a special chuck on the machine, thus not only insuring that the work will be held accurately and rigidly, but also simplifying the chucking operation. The operator assembles a cylinder barrel to a ring while the previous piece is in operation on the machine.

After grinding, the barrel and cylinder head are assembled, and the interior of the barrel is given a final finish by honing with the equipment shown in use in Fig. 4. This equipment consists of a Barnes vertical honing machine and a nine-stone hone. The cylinder is clamped to a fixture which holds it vertically

in alignment with the spindle while the hone is reciprocated in the bore and revolved at the same time. The work is cooled and the dust carried off by a constant flow of cutting fluid while the operation is in process. Approximately 0.0005 in. of stock is removed in this operation, leaving a

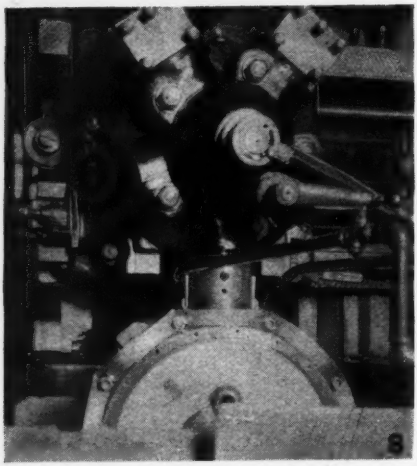


Fig. 8—Boring and facing cylinder pad holes in a crankcase

glass-smooth finish on the wall of the cylinder.

The crankcase of the "Wasp Junior," "Wasp," and "Hornet" engines is made up of a nose section, main section, blower section, and rear or accessory section. On the geared engine the nose is made in two parts, one of which is arranged to enclose the gearing. The main section is made in two parts, and is of forged aluminum alloy. The section is divided on the center line of the cylinders, thus making possible the use of forgings which are said to have a strength approximately one and one-half times that of heat-treated castings.

In Fig. 5 the front half of a crankcase is shown set up on a vertical boring mill to be bored and faced. Here the piece is faced and counterbored to 16.500 in. for the blower fit, and the center hole is bored to 5.289 - 5.291 in. An allowance of 0.0005 in. is made on the blower fit.

In order to insure a perfect fit when the two halves of the crankcase are assembled together, the contacting surfaces are lapped until an oil-tight bearing is obtained. The lapping operation is performed in the Norton lapping machine shown in operation in Fig. 6. This machine consists primarily of an overhanging arm from which the work-holding mechanism is suspended, and a flat, circular lap which revolves under the work. In this case the work is held by an expansion arbor which is slipped into the hole in the center of the case, thus avoiding any spring which might result from clamping the piece in a chuck.

The close-up view of the expansion arbor, Fig. 7, shows the method of construction. There are three rollers, each located in a cored recess which is filleted in such manner that, when the pressure exerted by the lap starts to revolve the work-piece, the rollers are carried into the filleted corners, where they are forced outward until they grip the wall of the hole and prevent the piece from rotating. The work is released immediately by revolving it backward a slight amount, thus releasing the pressure against the rollers. A special compound of oil and abrasive is used to obtain the desired finish, and from 0.002 in. to 0.004 in. of stock is removed. The operation takes from 15 to 20 minutes.

After the two halves of the crankcase have been assembled, the cylinder pad holes are bored and faced in the vertical boring mill shown in Fig. 8. The tool is a double-blade "Kelly" reamer, especially made for this op-

(*Continued on page 30*)

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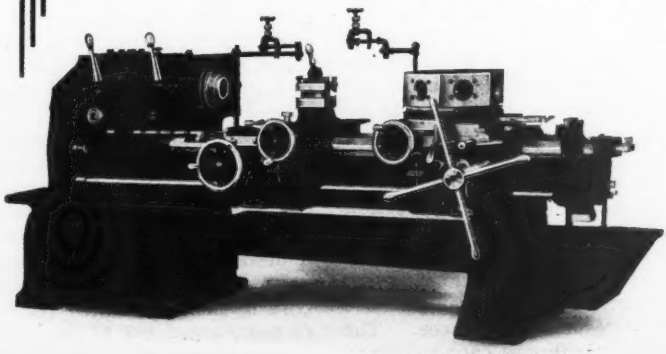

Cincinnati-Acme Universal Turret lathes are built in three sizes. Illustration shows the No. 1 size with 2½-inch capacity.

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Case Hardening vs. Nitriding

By GEORGE M. ENOS
Assistant Professor of Metallurgy, University of Cincinnati

THERE are two general methods by which great surface hardness may be obtained on steel, while the tough condition of the central portion, or core, is retained. These two methods are usually designated as "Case Hardening" and "Nitriding." The former process was developed many centuries ago; the latter has been developed to a point of commercial value only within the last ten years. Much research work is still in progress on both processes. It is the purpose of this article to compare the processes in general as they are carried on commercially at the present time.

Definitions

Case Hardening: "Carburizing and subsequent hardening by suitable heat treatment, all or part of the surface portions of a piece of iron base alloy."

Nitriding: The process of heating an iron-base alloy in contact with a source of nitrogen at a temperature such that the nitrogen content at, or near, the surface of the steel will be materially increased, thus securing great surface hardness.

Qualifications, or additional information, should be given in connection with each definition in order to arrive at a correct understanding of each process, and thus reach a basis for comparison. Both processes produce hard, wear-resisting surfaces. The list of parts which are case-hardened for use in industry is long, and includes such common articles as gears, pinions and shafts. Nitriding, in general, may be used in place of case-hardening unless severe shock or impact is to be encountered.

Case Hardening

While wrought iron, or any iron low in carbon, may be caused to take up carbon if heated to sufficiently high temperatures, the materials which are most commonly carburized are low carbon steels and certain alloy steels. Carburization, sometimes called "cementation," means simply that carbon is added to the outer portion of the steel by heating in contact with carbonaceous materials. Thus a high carbon steel is formed on the case, and the carbon content should gradually decrease towards the center. Carburization may be carried out by packing the parts with carburizing "compounds" in suitable containers, or by heating in a suitable furnace through which a gas rich in carbon is passed.

There are a number of variables which affect the efficiency of the process. The temperature is usually held constant within fairly close limits, and is not lower than 1600 deg. F., or higher than 1850 deg. F. The depth of case obtained will depend somewhat upon the temperature—the higher the temperature, the greater the penetration. The case is that portion of the carburized piece which has a definite increase in carbon content as the result of the carburization. The core is the part which remains unaffected.

Following the carburization, the part must be heat-treated to refine the grain size (which will have increased during the carburization) and quenched from above the critical range for the case in order to harden

(*Continued on page* 20)

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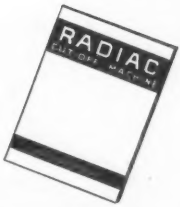

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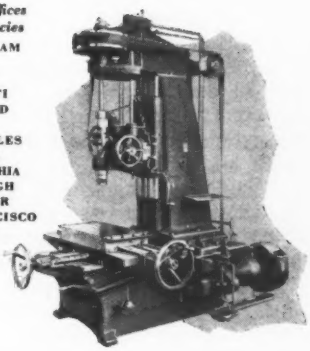

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No. 2 JIG BORER

HARTFORD, CONN., U. S. A.

Case Hardening vs. Nitriding

(*Continued from page 16*)

the surface. The hardened parts may be tempered (drawn) to relieve strains.

Various "compounds" are on the market in which the parts may be packed for carburizing. These usually have a base of charcoal, or some form of coke, in granulated form, and have various amounts of substances called "energizers" in the mix. These energizers tend to increase the efficiency of the carburization, and are usually carbonates.

Cyaniding is a process which produces a thin case on the steel by heating in contact with a cyanide salt, the temperature range being about the same as for carburizing. The work is quenched.

It is beyond the scope of this article to discuss the theories concerning the mechanism of carburization. It will be sufficient to state that the carbon transfer is believed to take place from carbon compounds in the gaseous state. As to the necessity of subsequent heat-treatment, it will be understood that after carburization the steel contains a gradation of carbon from high carbon, usually .9 to over 1 per cent, in the case, to low carbon content in the core. The "best" heat treatments take account of this fact, and reheat and quench one or more times, to refine grain size and harden the case, the latter operation being just the same in principle as the hardening of any carbon tool steel. A case-hardened piece, then, has a tough, low carbon core, backing up a hard but somewhat brittle case.

Nitriding

It has long been known that nitrogen has the effect of increasing the surface hardness, and embrittling steel. Recent developments have shown the way to take advantage of the hardness and reduce the brittleness. Ordinary carbon steels and many alloy steels can be made surface hard by a nitriding treatment, but, with few exceptions, the case produced is either too thin or too brittle, or both, to be of commercial value.

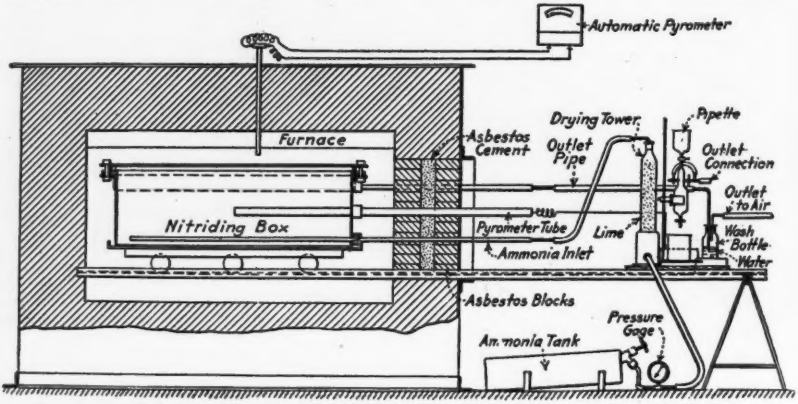

Figure 1.—Diagrammatic Sketch of Nitriding Apparatus (After Hommerberg & Walstead, Trans. A. S. S. T. 1929)

At the present time steels of the Nitralloy series are the most popular. The Nitralloy steels contain chromium and aluminum, and small amounts of other elements. The nominal values for the analysis are: aluminum 1.25 per cent; chromium 1.5 per cent; molybdenum .20 per cent; carbon .25-.35 per cent, and manganese, silicon, phosphorus, and sulphur, held

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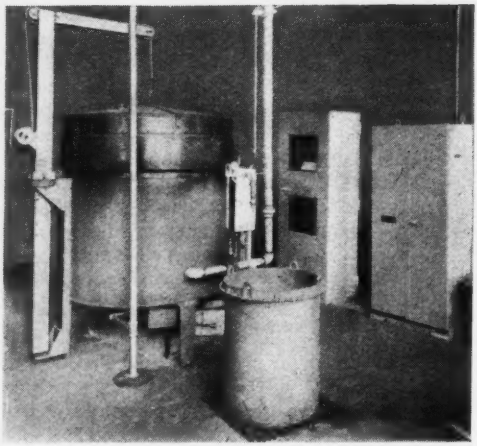

Figure 2.—Electric Furnace used in Nitriding (Courtesy of Leeds & Northrup Company)

within limits for a good grade of alloy steel. Other steels, notably chromium-vanadium steels, can be nitrided. Steels containing nickel do not nitride satisfactorily.

In a general way the nitriding process may be described as follows:

The parts to be nitrided are finished to size, or slightly undersize, depending on the tolerances allowed. The nitriding process produces a slight growth, of the magnitude of .001 in. in each direction for the usual nitriding temperatures. The parts preferably should be oil quenched and tempered before nitriding. There are two general processes, "batch" and continuous. The "batch" process, having been more widely used up to the present time, will be described in more detail.

A container which can be sealed gas tight is loaded with the parts in such a way that free circulation of gas can be maintained. The container may be made of almost any material which will withstand the temperature and action of the ammonia gas. The non-corroding, high-nickel, high chromium steels, monel metal and Nichrome, are quite satisfactory. The design may vary, but a rectangular box with a suitable lid is often used. Pipe connections are made to the box for admitting ammonia gas and permitting the waste gases to escape. A fan may be incorporated in the box to circulate the gas, or the pipes may extend into the box and be perforated at intervals to secure good distribution. One or more thermocouples are usually incorporated in the set-up so as to indicate the temperatures attained. The drawing, Fig. 1, indicates some of the features of the batch process. In Figs. 2 and 3 are shown types of electric furnaces

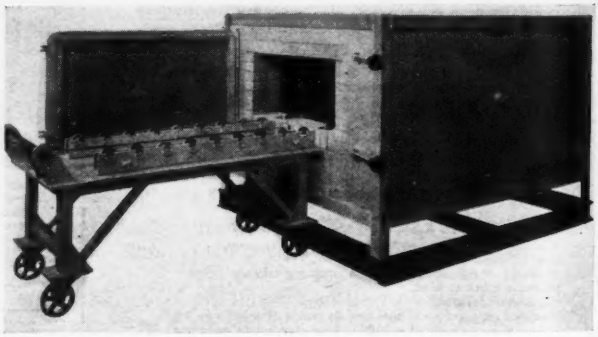

Figure 3.—Horizontal Type of Electric Furnace (General Electric Company)

designed especially for nitriding. Of course, gas or oil furnaces may be used, the box being placed in a suitable sized furnace.

The furnace is brought up to heat, and ammonia gas is admitted from the

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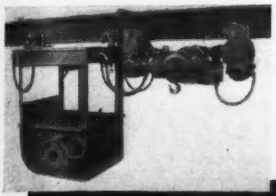

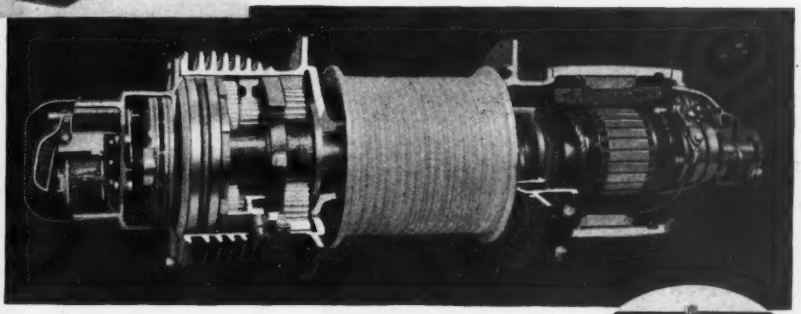

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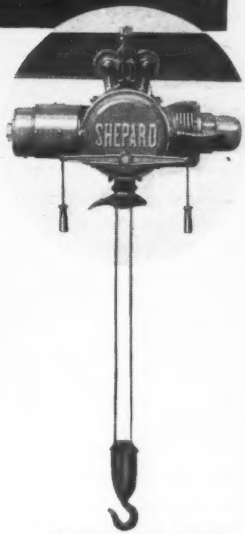

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tank. The pressure is regulated, the amount of gas admitted being dependent on the degree of dissociation of the gases as they leave the box. Ammonia gas partially or completely breaks down at the nitriding temperature, forming hydrogen and nitrogen. It is not considered good practice to

level to which the water will rise is read on a scale, on the tube, usually calibrated to read directly the percentage of ammonia dissolved.

The nitrogen released from the ammonia is active, at least momentarily, and a part of it reacts with the iron to form iron nitrides. Nitrogen from the

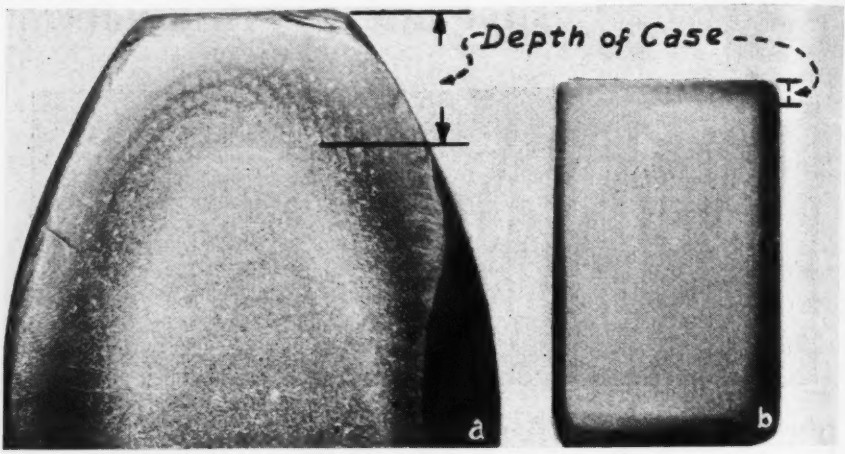
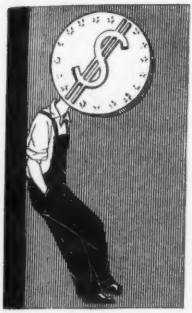


Figure 4.—(a) Photomacrograph showing depth of case on case hardened gear tooth. Carburized about 16 hours. Magnification X5. Nitol etch. (b) Photomacrograph showing depth of nitrided case obtained on Nitralloy. Nitrided about 48 hours at 975 deg. F. Magnification X5. Nitol etch.

cause complete dissociation in the box, as, if too much hydrogen is formed, decarburization is likely to occur, which may be the cause of a poor case. Accordingly the flow of gas is regulated so that measurements made on the volumes of nitrogen and hydrogen formed will show about a 30-50 per cent dissociation. Opinions of authorities differ as to the degree of dissociation which is permissible. The method of measuring the dissociation is simple; ammonia gas is soluble in water, nitrogen and hydrogen are not. A definite volume of the exit gas can be trapped in a glass measuring device called a "pipette" (see Fig. 1), and water admitted from a reservoir, dissolving the ammonia gas. The

air will not react in the same way. The only other commercially available sources of active nitrogen at the present time are the cyanide salts. Suitable steels can be nitrided to a very slight depth in cyanide salts at the nitriding temperature. The temperature employed may vary between certain limits, say between 900 deg. F. and 1200 deg. F. A temperature of 975 deg. F. is often used in commercial practice. The higher the temperature, the greater the penetration, but the case will not be as hard as if the lower temperature ranges are employed.

Some progress has been made in developing continuous processes. The Westinghouse Electric and Manufacturing Co. has developed a method



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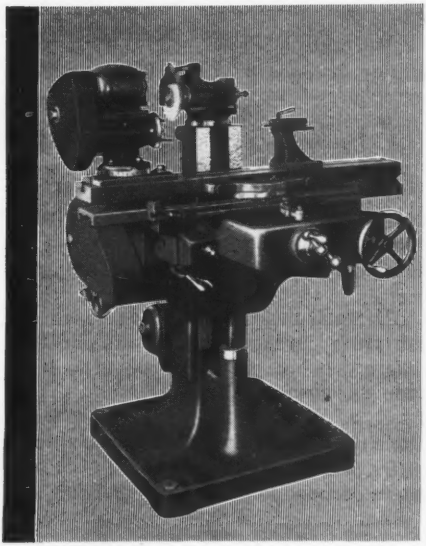

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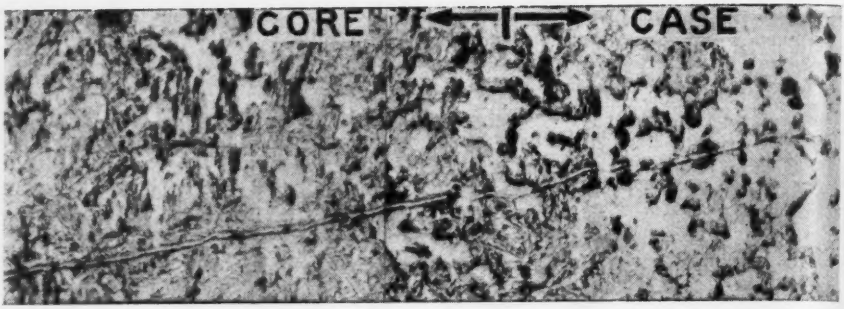

Figure 5.—Photomacrograph showing how width of micro-character scratch varies from core to case on carburized gear tooth as shown in Figure 4a. Nitol etch. 100 X magnification.

whereby two hearths are arranged so that the upper portion of an electric furnace, called the "bell," with the various connections, can be used alternately on the hearths. Thus one hearth can be unloaded and loaded while the load in the other is being nitrided. The Surface Combustion Company has described a gas-fired furnace where the work enters the furnace through a suitable seal, travels on a conveyor during the nitriding period, and emerges through another seal.

Comparison of Case Hardening and Nitriding

In Table 1, the essential features of each process are summarized. There are many alloy steels which can be successfully case hardened, but the common practice with both alloy and plain carbon steels is to use steels low in carbon in order to have a tough core. The nitriding steels are fewer in number, the "Nitralloy" type being most commonly used.

Hardness is obtained on carbonized parts by quenching the steel from the proper temperature. In nitriding, nitrides of iron are formed which form a comparatively thin case. Probably the outstanding feature of the nitriding process is that quenching is not required, and hence some of the defects or difficulties encountered in case hardening are avoided. There is no danger of cracking, warping or distortion with nitrided work, since the temperature employed is below the critical range, and further, fast cooling is not required. No straightening operations are required.

On the other hand, if the necessary precautions are not taken, the nitrided case may be too brittle or the growth may be excessive. After nitriding, it is impractical to finish to size, except by grinding. The principal disadvantage in the nitriding process is the length of time required to produce even a light case.

Figure 6—Photomicrograph showing variation in width of micro-character scratch from core to case on nitrided piece shown in Fig. 4b. Nitol etch. 100 X magnification.

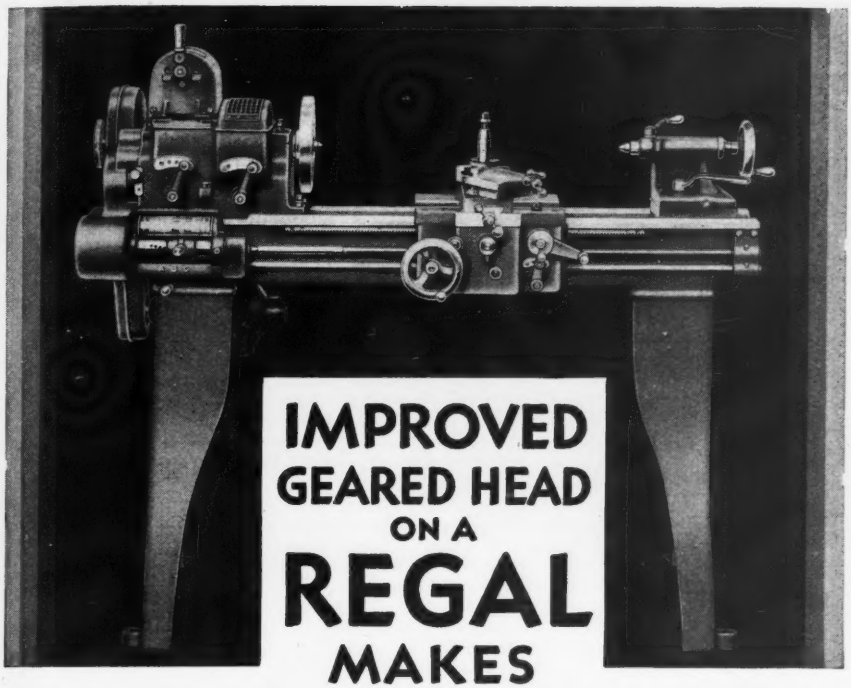

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TABLE 1

Comparative Data On the Case Hardening and Nitriding Processes.

	CASE HARDENING	NITRIDING
Steels used	Low and medium carbon, plain carbon or alloy steels of many types.	Alloy steels containing aluminum, chromium, and molybdenum.
Increased Hardness due to	Increased carbon content in the case.	Increased nitrogen content in the case.
Carbon or nitrogen obtained from	Solid, gaseous, or liquid material which will give up carbon at the carburizing temperature.	Gaseous or liquid material which will give up active nitrogen at the nitriding temperature.
Range of temperatures used	1,600-1,850° F. (871-1,008° C.).	950-1,180° F. (510-637° C.).
Heat treatment prior to forming case	Normalizing or other treatment may be desirable, but is often omitted.	Quenching and drawing is recommended.
Heat treatment after forming case	Usually necessary to re-heat and quench at least once.	No treatment necessary.
Maximum hardness obtainable	700 + Brinell.	1,000 + Brinell, on surface.
Depth of case obtainable	Depends on time, temperature, source of carbon, and other factors. Examples: Time in hrs. / Temp. °F. / Depth in inches 4 / 1,650 / .020 5 / 1,750 / .047 10 / 1,750 / .110	Depends on time, temperature, packing material, source of nitrogen, etc. Examples: Time in hrs. / Temp. °F. / Depth in inches 20 / 950 / .020 72 / 950 / .035
Defects occasionally encountered	Soft spots, spalling, or enfoliation, warping, distortion, cracking.	Brittle case, non-uniform depth of case.
Corrosion resistance	No more than original steel.	Considerable resistance to corrosion in the atmosphere, water, and salt spray and to some other media is developed.

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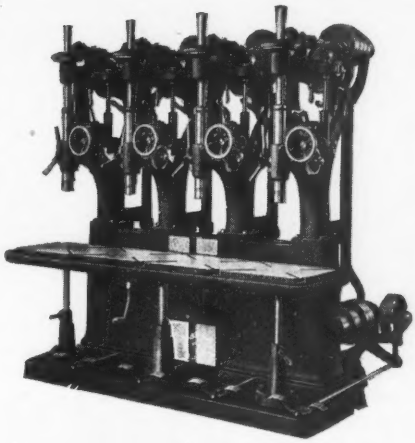

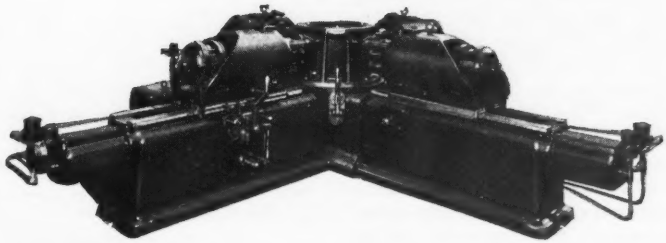

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While high hardness values are not necessarily a criterion of wear resistance, it is a fact that, for a depth of a few thousandths of an inch, the nitrided surface is harder than the case hardened surface. The extreme outer layer on a nitrided surface is relatively soft, but below this is a zone of extreme hardness, the hardness gradually decreasing until the core hardness is reached. For certain purposes nitrided parts will outwear case hardened parts; for other uses the case hardened parts may be more satisfactory.

In order to obtain the high hardness numbers reported for the nitrided case, special methods of testing must be employed. The ordinary hardness testing instruments (*Brinell, Scleroscope, Rockwell*) usually available in plants, can be used if care is taken, and if only a *comparison* between parts is desired. Thus the Brinell may be used for detecting brittleness in a nitrided case, by using light loads and noting whether the edges of the impression are cracked or not, but the true Brinell number is not obtainable due to the case being too thin. The Brinell values reported are obtained by the Vickers Hardness Tester or the Herbert Pendulum, and converted to Brinell units. The Scleroscope may indicate comparative values, but there is danger of injuring the hammer point. The diamond cone of the Rockwell tester may be used if the weight is removed from the lever arm. The Monotron instrument is preferred by some users for testing thin cases. Both case hardened and nitrided parts will be file-hard if the operations are correctly carried out.

The depth of the case obtainable by the two processes is quite different. Figure 4 gives a typical view of deep cases as obtained in each process. The micro-character hardness tester is sometimes used to indicate case depth on polished cross-sections, as it is difficult to etch nitrided samples so as to show the true depth of case. In Figure 5, comparison may be made between the width of scratch on Nitrided Nitralloy and on a Case Hardened Gear Tooth. The scratches were produced by a sapphire point, under a load of 3 grams, pulled slowly across the sample (Micro-character hardness tester.)

In conclusion, it may be stated that each process has its limitations and it is not likely that either one will supplant the other in industry. No attempt has been made to compare costs, since it is difficult to evaluate all the factors. In general it may be said that nitriding is somewhat more expensive than case hardening at the present time.

Machining Parts For "Wasp" and "Hornet" Engines

(*Continued from page 14*)

eration. The case is held on a fixture which centers the piece and aligns it vertically. The hole for each cylinder is bored to 5.947 in., plus or minus 0.003 in., and the face of the pad is held within limits of 0.002 in. from the center-line of the case.

(Methods of machining the super-charger and master rod will be discussed in the May issue.)

Eighth Annual Convention National Association of Foremen

The National Association of Foremen will hold its Eighth Annual Convention at the Biltmore Hotel, Dayton, Ohio, on Friday and Saturday, June 12th and 13th. A number of prominent industrial leaders are scheduled to address the convention, and the indications are that this convention will be the most outstanding of any held thus far. All foremen, superintendents, and other executives—whether members of the association or not—are invited to attend. A copy of the program can be obtained by addressing The National Association of Foremen, Refiners Building, Dayton, O.

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FORMICA *Non-Metallic* GEARS

The Modern Tooling Specialist; His Place In Industry

With a few illustrations of the tool specialist's product

By DONALD A. CLARK

THE science of "tooling" has, in the last few years, passed into a new stage of its evolution. The development of the modern type of tool for high production work requires a degree of skill and ability no less than that required to design the machine upon which the tool is to be used. In selecting equipment for a production job, consideration is divided between the machine and the tools that are to be used with it.

The building of machine tools is, however, generally considered a sufficient task by the machinery manufacturer, and the matter of tooling is usually left to the user of the machine. The purchaser, on the other hand, in many cases is too busy with the problems involved in the manufacture of his product to be able to give the proper attention to the matter of tooling. Thus an opening has been created for the tooling specialist, whose sole task consists in the development of jigs, fixtures, and attachments whereby the greatest production value of the machine may be secured for the user.

The Snyder Tool & Engineering Corporation, of Detroit, is an organization of tooling specialists. This company maintains a large and well-equipped plant, manned by a corps of expert designers and toolmakers. A specialty is made of mechanical units that can be co-ordinated with the mechanism of the machine tool in order to obtain the highest production with the type of machine that is to be used. A good example of this type of equipment is shown in Fig. 1. Here is a complete tool set-up consisting of a 23-spindle ball-bearing head, bushing plate, and special box table for machining the gear pockets and shaft holes in pump-bodies, and for drilling and countersinking the cover screw holes.

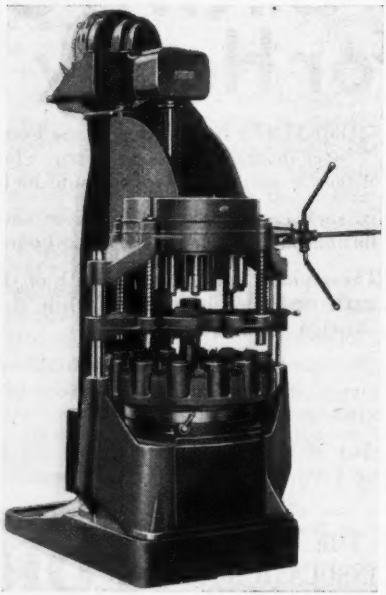

Fig. 1—Snyder Tool Set-Up for Machining Pump-Bodies

The fixture is anchored to a Snyder rotary table on the machine with machine screws and dowels, upon which it is indexed for the complete machining of each piece. Each workpiece locates from a turned section which fits into

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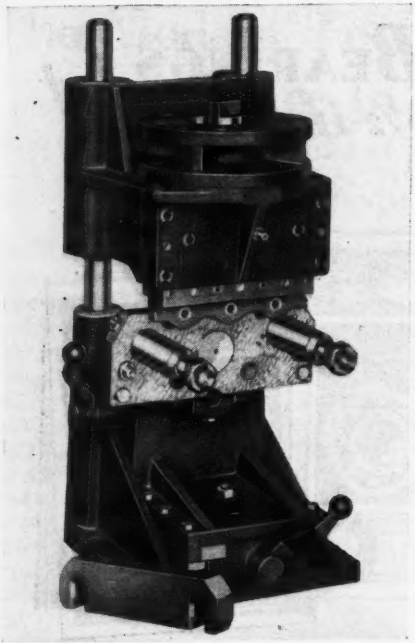

Fig. 2—Three bosses on a cylinder block are back-faced simultaneously with this outfit.

a hole in the fixture and is held by clamps. The sequence of operations is as follows: Drill one 29/64-in. short shaft hole half way through; drill one 29/64-in. long shaft hole half way through; rough face No. 1 gear pocket; rough face No. 2 gear pocket; drill 29/64-in. short shaft hole through; drill long shaft hole through; rough ream short hole; rough ream long hole; tap drill six holes; countersink six holes; semi-finish ream No. 1 pocket; spot-face top; semi-finish ream No. 2 pocket.

These pieces were formerly processed with the aid of a turret lathe and drill press, a production of from 8 to 10 pieces per hour being obtained. By using the outfit described above, production was increased to from 45 to 50 pieces per hour.

The tooling set-up shown in Fig. 2 was designed and built by the Snyder organization for use in back-facing three small bosses on an automotive cylinder block. This fixture is used on a Barnes drill press. The cylinder is located on the fixture by slipping the No. 1 and No. 3 bores over the projecting studs, where they are held by means of the strap shown lying at the side of the fixture. The three bosses are machined simultaneously by three tools that are gear-driven from a central spindle, the shank of which slips into the spindle-sleeve on the machine. From $\frac{1}{16}$-in. to $\frac{3}{32}$-in. of stock is removed from each boss and from 40 to 45 cylinders are machined on this operation per hour.

A Snyder set-up for the simultaneous drilling and reaming of the bolt holes in connecting rods for automobile engines is shown in Fig. 3. This outfit consists of a Snyder multiple 8-spindle head, bushing plate, and 3-

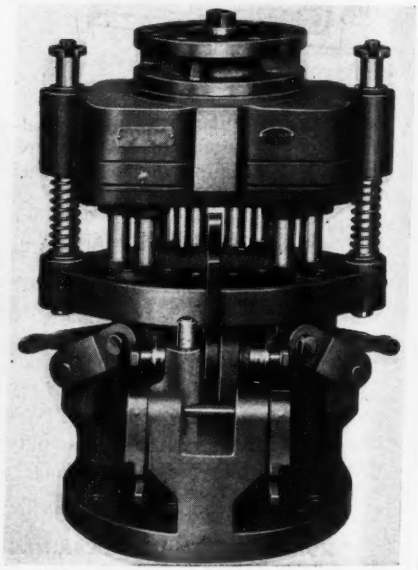

Fig. 3—This equipment converts a single-spindle drill into a multiple-spindle high-production tool.

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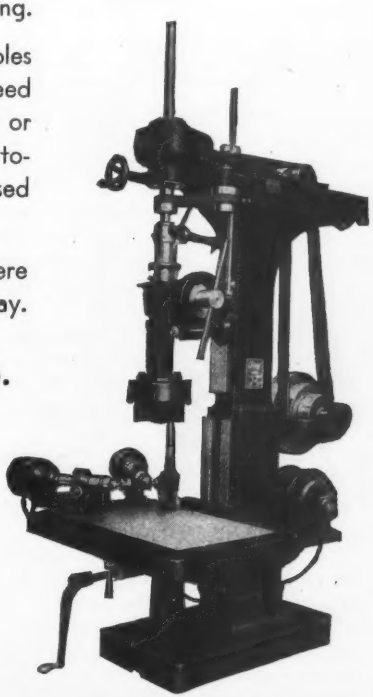


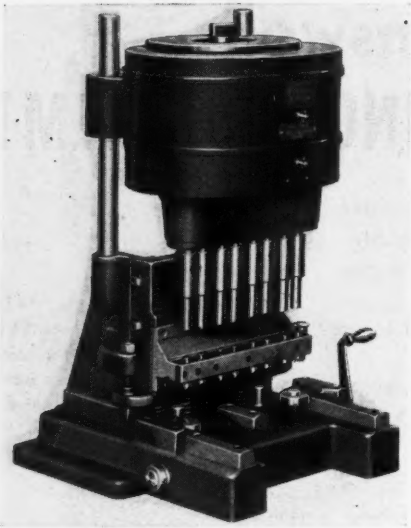


Fig. 4—Here is a tool which, when applied to a single-spindle drill, will back spot-face eight valve spring seats on a cylinder block.

station work-holding fixture. With this tool a single-spindle drill press is converted into a multiple-spindle high production tool. The fixture is bolted to the drill press table, in line with the spindle, so that the square end of the fixture spindle can be inserted into the square opening in the end of a stub arbor that is held in the machine spindle.

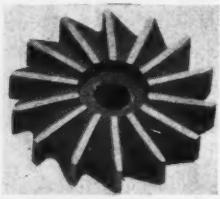


Fig. 5—Eclipse cutter used with the tool shown in Fig. 4.

Two rods are machined at a time, each rod locating from the crank pin bearing hole and being held in position by U-clamps. The holes are drilled to 15/64 in. and reamed to ¼ in. within limits of 0.0005 in. Production on this operation is from 120 to 140 pieces per hour.

The tool shown in Fig. 4 is used to back spotface valve spring seats on automotive cylinder blocks, for which 1-in. Eclipse milling cutters are used instead of the usual counterbores. One of the cutters is shown in Fig. 5. This outfit is also used in connection with a Barnes single-spindle drill, the eight spindles in the multiple head being driven from the machine-spindle. To load the machine, the head is raised, the block is clamped in position, the head is lowered to insert the spindles through the push rod guide holes in the casting, and the stub spindles on which the cutters are mounted are locked to the fixture spindles by means of bayonet locks, as indicated in the drawing, Fig. 6. The operation is now ready to proceed.

Hand feed is used and approximately 1/16 in. of stock is removed from each spring seat. The amount of stock removed is governed by an adjustable stop located on the side of the fixture. Approximately 200 blocks can be ma-

(*Continued on page 39*)

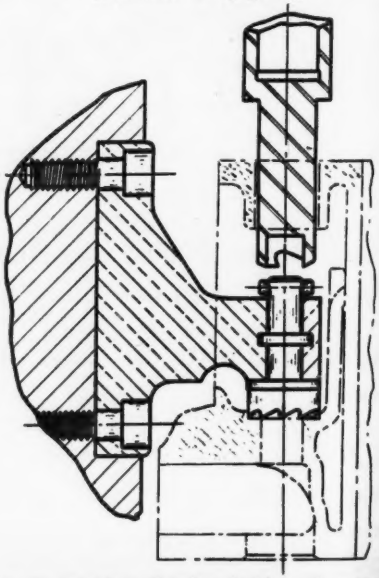
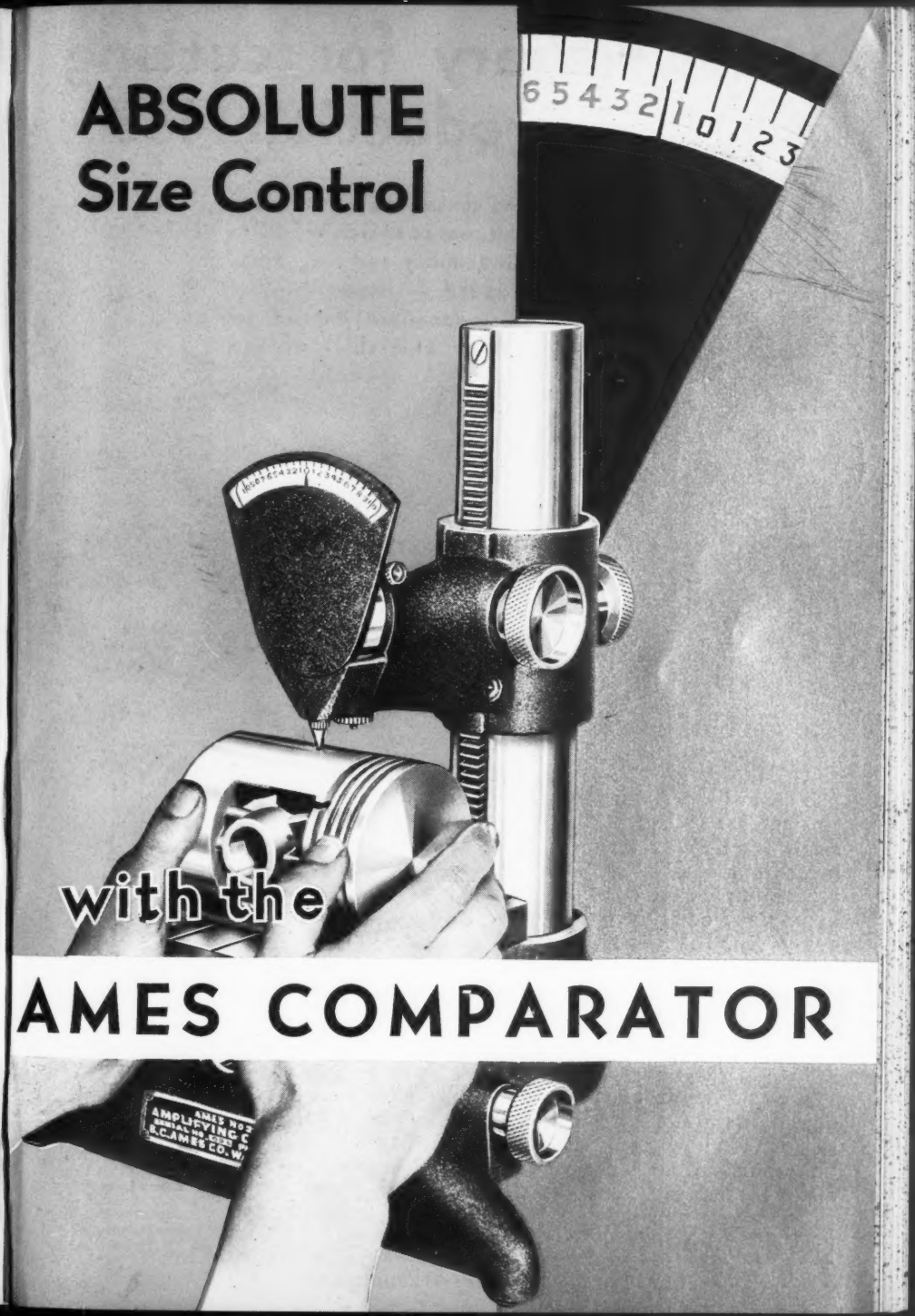


Fig. 6—Drawing showing locking of cutters to spindles on tool shown in Fig. 4.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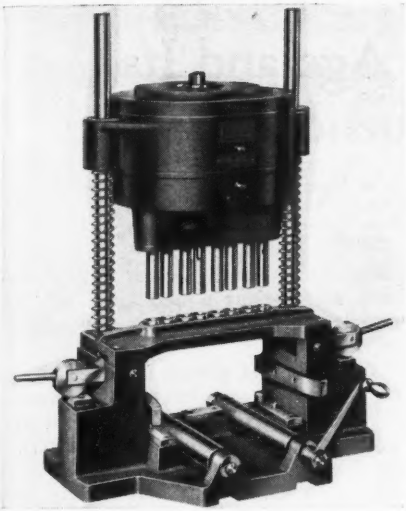

Fig. 7—Tool used with single-spindle drill to ream push rod guide holes in cylinder block.

The Tooling Specialist

(*Continued from page* 36)

chined with each sharpening of the cutters; when necessary to remove them, however, they can easily be removed by first removing the front plate. The production on this operation is from 40 to 50 blocks per hour.

The outfit illustrated in Fig. 7 is used in connection with a Barnes drill to ream push rod guide holes in a cylinder block. To locate, the block is pushed in under the bushing plate, between two hardened steel strips fastened to the sides, and against two stops at the rear of the fixture. At this point the handle shown at the front of the fixture is turned, revolving the shafts upon which the block is resting and allowing the block to settle down on locating pins in the base of the fixture. The shafts referred to are actually cams by which the block can be raised and lowered. Side arm clamps are then slipped into position and tightened by means of cam action levers, shown at the sides.

The tools are high speed steel reamers, and each removes approximately 0.010 to 0.012 in. of stock. Machine feed is used, and a production of from 40 to 50 blocks per hour is obtained. This fixture is an example of the highest type of fixture design and meets the three essentials; simplicity of operation, accuracy, and speed.

Grinding and Heat Treatment As Causes of Cracks In Hardened Steels

The latest addition to the series of booklets on the various phases of grinding, issued by the Norton Company, Worcester, Mass., is a booklet titled "Grinding and Heat Treatment As Causes of Cracks in Hardened Steels." The information contained in this book has been compiled over a considerable period of time, and represents the findings in a large number of cases where the Norton Company has been called upon to ascertain the causes of cracks in ground surfaces. More recently, the information was checked by special tests in which typical tool and die steels were heat treated and ground by a variety of methods. The data given in the book is quite complete, in that it describes the preparation of the samples, characteristics of the steels, quenching and drawing temperatures, Rockwell hardness after heat treating, grades of grinding wheels used, and results obtained in all instances. There are nine photographs of the samples showing the various types of cracks that may be caused by incorrect methods of processing. A copy of this booklet may be obtained without charge by any machine shop executive.

G & L Catalog No. 45

Catalog No. 45, issued by the Giddings & Lewis Machine Tool Co., Fond du Lac, Wis., contains descriptions and illustrations of all the improvements that have recently been incorporated in the design of the G & L No. 45 High Power Precision Horizontal Boring, Drilling, and Milling Machine. Each part of the machine is described in detail, and complete information is given as to materials, limits of accuracy, methods of assembling, and so on. A copy of this book will be sent without charge to mechanical executives.

The Machine Age and Its Consequences

An address by Franklyn Hobbs, Director of Research, Central Trust Company of Illinois, before the Thirty-Third Annual Convention of the National Metal Trades Association Convention at Cincinnati, April 15, 1931.

THE most important matter which comes before the people of any country is the employment of its workers. In this connection, it is an interesting fact that the United States has a higher percentage of workers than any other nation on the globe, with the possible exception of Canada, in which country conditions are much the same as in the United States. From the top to the bottom of the social structure, and in every section between those two extremes, we find in America the highest percentage of people who work. In the top group, I personally know many millionaires and multimillionaires who have worked and who now work harder than most of us. I know a number of such men who are putting in longer hours and working harder than your speaker. This condition is almost peculiar to America. Perhaps no millionaire in Europe can be found at his office or place of business before 9 a. m. and after 5 p. m., but the richest man of my personal acquaintance is always on the job for that many hours or more, when in his own town.

For five years I passed the window on La Salle Street which was beside the desk of Philip D. Armour, the founder of the Armour Packing business, and several hundred mornings had passed before I was able to get down to business ahead of Mr. Armour. I finally discovered that he was at his desk each morning at 7:15. I have almost daily dealings with a man who is worth several million dollars, and he has a bad habit of telephoning my office before my arrival at 8:45.

In the lowest group, our percentage of beggars is far below that of any of the older countries of Europe and the Asiatic countries, and below that of the Latin-American countries as well. In America it is certainly true that "everybody works but father," and he slaves for the whole family.

And so employment is the one big and important thing in our American social life. A job, a chance to earn money, is demanded by every adult who is physically and mentally able to do anything in the way of useful work.

Nearly 40 per cent of our entire population is classed as gainfully employed, but we may add to this group of nearly fifty million people a few million more who actually do some work, and some of them do a man's work. Literally millions of boys and girls on the farms do as much work every twenty-four hours as many of the men and women in the cities who are holding down regular jobs. The one great and legitimate demand of the American man or woman, boy or girl, is a chance to work under healthful conditions and to earn something more than a living wage. And this country of ours is giving that chance in larger measure, and to a larger percentage of its people, than any other country.

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tury may be properly called "The Machine Age." During the thirty years that are behind us, we have installed enough machinery and labor-saving equipment in the operating departments of American business to displace more workers than there are inhabitants on the continent of North America. The introduction of machinery into manufacturing plants and into offices has displaced millions upon millions of workers. Machinery has literally robbed them of their jobs and thrown them out on the street to look for a new job. You all know that is true, so proof is unnecessary.

Now, over in England, they have installed less than half as much machinery, and thrown less than half as many people out of employment, which is equally true of Germany. In India, they have installed less than 1 per cent as much machinery as has been installed in the United States, and so very few people have been thrown out of work because of the introduction of labor-saving tools and equipment. And then there is China, where they have installed only one five-hundredth part of the machinery introduced into our activities. So practically no one has been thrown out of employment in China by machines.

And so, of course, there should be no unemployment in China or India, and little in Germany and England as compared with this country of ours. It should not be necessary to present any evidence beyond these comparisons to prove to the complete satisfaction of anyone with a head on his shoulders that the introduction of machinery to replace manual effort has been the sole cause of improvement in working conditions and in wages, and in the reduction of unemployment.

About the time that I was large enough to perform any sort of labor on the farm, about 60 per cent of our entire population was making its living on the farm. Today, about 30 per cent of our population makes its living—or tries to—on the farm. So thirty-seven million people who, under those early conditions, would have been working on the farm are now getting their livelihood in cities and towns. We have been able to absorb from the country districts into the cities and towns as many people as there were in the United States on the day the Civil War ended. And this absorption has been made possible only through the introduction of machinery. Imagine trying to build a skyscraper with hand labor only, as was the case with the pyramids of Egypt. And then imagine the building of an automobile with the hands of man, and without machines of any kind.

Compare conditions in Asia and Africa where they use little machinery with the conditions in our own country, where we buy $100 worth of new productive machinery per year per family. Or, if you please, compare the conditions in our own country during the post Civil War period, or during the last quarter of the nineteenth century, with the conditions which we have today. The case against the machine falls of its own weight.

Talk about the good old times sounds very well until we produce the actual figures on those so-called good times; the good times of 1880, when the average pay of the factory worker was 75 cents a day, or the good times of 1900 when the average pay of the factory worker was $426 per year—equal to about $1.42 a day. And now the machines have begun to arrive. Six per cent of all of the people in the United States were working in factories at the end of the last century for that average wage of $426 per year. And now let us jump thirty years to the end of the year 1929 when 7 per cent of our entire population

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THE CARPENTER STEEL CO. READING PA
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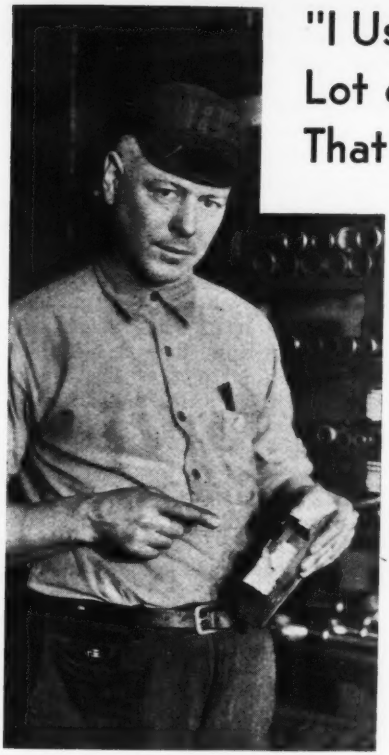


"I Used To Get a Lot of the Blame That Belonged To the Tool Steel"

—says SAM.

"But that was before they gave me Carpenter Tool Steel to work with."

You know the story . . . a tool cracked in hardening or broken in service . . . the tool-maker usually gets the blame, when very often it is the fault of the tool steel.

No more happenings like that, when you use Carpenter DIOK Timbre Tested Tool Steel. It takes the guess out of tool making by assuring you a tough steel—the kind you need to make good tools.

Write for Bulletin "C-1," telling how you can test tool steel for toughness. A free copy is yours for the asking, without obligation.

THE CARPENTER STEEL COMPANY

Mills and Main Warehouses: READING, PA.

Branch Warehouses:

CHICAGO, 1516 Carroll Ave.
DETROIT, 6181 Warren Ave., W.
INDIANAPOLIS, 633 Fulton Street
CLEVELAND, 1515 Hamilton Ave.
HARTFORD, 3284 Main St.
ST. LOUIS, 4063 Forest Park Ave.
PHILADELPHIA, Horace T. Potts & Co., East Erie Ave. and D St.

was employed in factories at an average wage of $1,318 for the year.

A generation ago, the taking of the U. S. Census of manufactures uncovered the fact that the pay envelopes of the workers in the factories contained 18 per cent of the value of the output of those factories. During this generation we have constantly added labor-saving machinery, and the taking of each successive manufacturing census has shown that the workers were finding in their pay envelopes from 16 per cent to 19 per cent of the total selling value of the product of the mills.

Over a period of thirty years, the workers have received $17 out of every $100 worth of manufactured goods sold, or about two-fifths of the value added to materials through processes of manufacture. Ten consecutive times have the figures of the Census Bureau proved that the workers receive an average of 17 per cent of the selling value of manufactured products. During the last thirty years the substitution of machinery has made it possible for one worker to produce the result which required three workers at the beginning of this period, and yet the workers have continued to receive their 17 per cent of the value of the product.

If the mill was producing 1,000 units per day and, through the introduction of labor-saving machinery, was able to produce 3,000 units per day, the workers received their 17 per cent on the additional 2,000 units, the same as on the original 1,000 units. The machines have made it possible during the generation of time for the worker to increase his income 200 per cent. The machines are earning two-thirds of the wages he receives. In lines of manufacture where mechanization has not gone far, wages are less, and in other lines, where mechanical assistance has reached the highest point, w a g e s have also reached the highest point. Briefly, the best paid factory workers are standing still most of the time watching a machine roll up money to stuff in their pay envelopes. The average pay envelope of the factory workers of this country contains three times as much money as it contained thirty years ago, and $2 out of every $3 in that pay envelope is earned by a machine and paid to a worker.

To say the cost of living has increased proportionately is to say that the introduction of machines into manufacturing enterprise has put bathrooms, electric lights, and radios into millions of homes, automobiles into millions of garages, and beef steak and fresh fruit on millions of tables that never knew them before.

I submit that it was not the humanitarian instinct of the American people which raised the standard of living for all of us, nor was it the work of the social agencies, nor yet the laws passed by the legislative bodies of nation, states, or cities. The standard of living of the American people has been raised to its present level by the machine, and that is the one and only reason why the standard of living in the United States and Canada for the people of the work-a-day world is higher than that available to the millionaires of any other country. And I make that statement without any mental reservation. The King of England at this moment suffers from a bad cold acquired by taking a bath in an unheated bathroom and trying to get warm before a drafty open fire. The conveniences of Windsor Castle fall short of those in the homes of the working man of Cincinnati.

And the end is not yet. More and improved machinery may make it possible for a man to earn more than a good living by working in a factory for a few hours a day without even

(*Continued on page 48*)

"Tools may come and tools may go but the chuck goes on forever"

This is a misnomer. While chucks continue to operate, they become obsolete. Their old battered bodies, chewed jaws, worn threads—their inaccuracies and lack of power will utterly ruin the efficiency of the finest machine tool in the world. . . . . .

The mighty chuck is the connecting link between the machine and the cutting tool. It must work easily, quickly, accurately, and powerfully. New model chucks have these four qualities to a marked degree; obsolete chucks have lost them.

From an economical as well as a production point of view, there are a dozen reasons why an old chuck should be replaced. . . . . .

Your dealer knows his chucks—how to use them—the models best fitted for your needs, whatever they may be. Just ask him.

The CHUCK MANUFACTURERS of AMERICA

A Deep Drawing Job

By A. E. GRANVILLE

FISHING tackle boxes should be as strong and waterproof as possible. For these reasons, the Outing Mfg. Co., Elkhart, Indiana, makes a line of tool and fishing tackle boxes of drawn steel, the bodies and lids

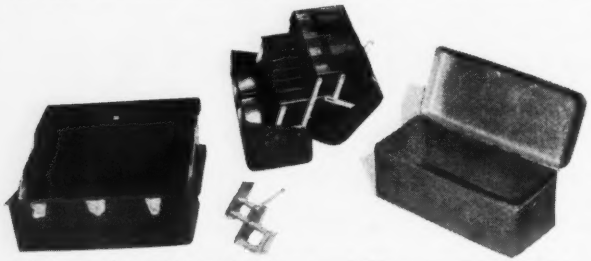


Fig. 1—These fishing-tackle boxes and lids are each made of a single piece of steel

each being made of a single piece of steel. The boxes are made in several sizes and styles, and some of them are made from single pieces of sheet metal. Two of the finished cantilever styles are shown at the left in Fig. 1, and an unfinished straight-end box at the right. The body of the box at the right is 16 in. long, 6½ in. wide and 5⅝ in. deep, finish size.

Box bodies are made of 21-gage lead-coated drawing steel, and are shaped in two draws. The first draw completes the real drawing work, the second draw serving to "square" the corners a little more. This will be better understood by an inspection of Fig. 2. Here the first draw is shown at the right and the second draw at the left. Just above is the blank used. The first draw is of practically the same dimensions as the second, except for the corners. The dimensions of the body in the rough are: length, 16 in., width 6½ in., and depth 6¼ in. The edges are trimmed so as to make the depth 5⅝ in., as previously mentioned. The shape and dimensions of the blank are of interest. The length of the blank is 25⅞ in. and the width 18 in. The ends are given as 5 in. radius, and a 2 in. angle, or bevel, is trimmed off each "corner." This size and shape of blank draws into the box body with practically no waste, as can be seen from the illustration of the second draw in Fig. 2. A Bliss 70-ton toggle press is used. The punch and die with which the operation is performed are

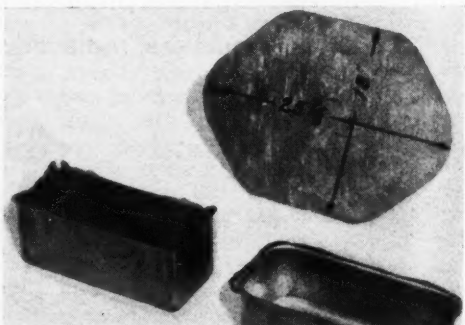
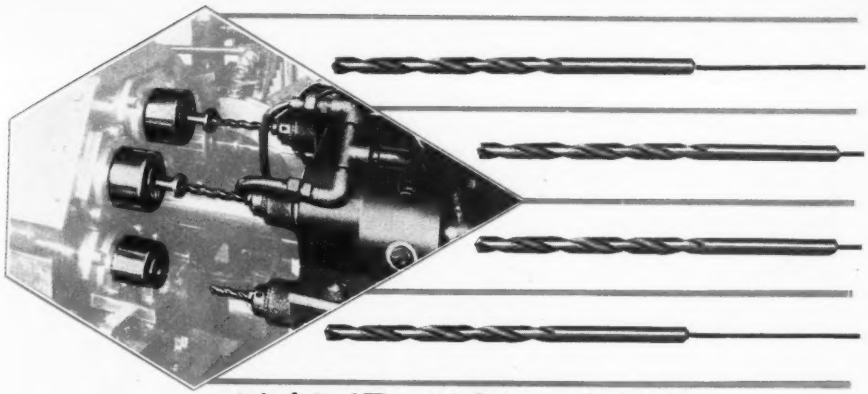


Fig. 2—Above, blank. Right, first draw. Left, second draw



HAVE YOU ANY

HORIZONTAL DRILLING In the 1/4" To No. 60 Range?

BLUE DIAMOND HIGH SPEED DRILLS

Capacity production of automatics and screw machines is easily maintained when the drilling operations are done with Blue Diamond High Speed Drills. The exclusive design of this new drill, contributing fast penetration, minimum breakage, long cutting life and deep drilling qualities, makes it the ideal tool for such work. Why handicap these expensive machines with inefficient tools — put Blue Diamonds on your automatics and screw machines and see what a difference this new drill really makes in tool and production costs. Order a few today and test them on your hardest jobs.

Ask your local distributor for Blue Diamond High Speed Drills in the Yellow Package — Jobbers' sizes to 1/4-in. and wire sizes to No. 60.

WHITMAN & BARNES
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Manufacturers of
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Canadian Factory
CANADIAN DETROIT TWIST DRILL
CO. LTD., WALKERVILLE ONTARIO

New York DETROIT *Chicago*

MAKERS OF FINE TOOLS FOR 77 YEARS

shown in the illustration Fig. 3.

As the drawing stock is lead-coated, no special oil is needed. The oil used is ordinary soluble oil which will come off easily in the cleaner. The only difficulty encountered in the second draw was that the corners had a tendency to tear, and have to be annealed. The annealing is done with the special four-burner device shown in Fig. 4 and is entirely effective.

The four gas burners are carried in an overhanging head. The box is placed on a holder, as shown, and is elevated by means of a foot pedal so as to bring the corners into correct relation to the gas flames. The annealed spots may easily be discerned at the corners. The annealing is done cleanly and quickly. The drawing output of the press on these boxes cannot be given with any degree of accuracy, as the work is intermittent and is timed so as to fit in with other operations. Edges are trimmed one at a time with shearing dies, the edge

Fig. 3—Punch and die with which the fishing tackle box is drawn to shape

being pushed in against the stop. This stop may be adjusted so as to trim one edge more than the opposite one,

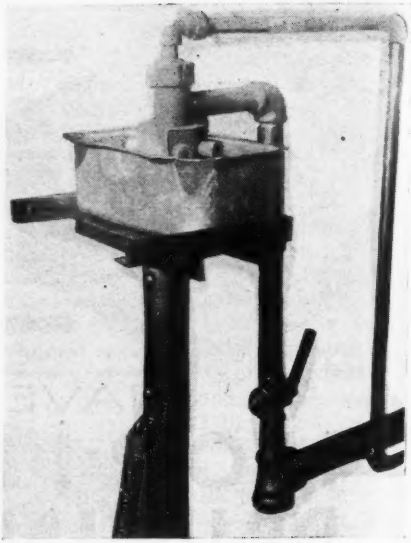


Fig. 4—Four-burner heater for annealing corners to prevent tearing

and the ends may be trimmed either straight or at an angle, according to the type of box being made.

Machine Age—Its Consequences

(*Continued from page* 44)

soiling his hands. The most senseless bit of buncombe which is offered for our consumption today is the bugaboo of technological unemployment caused by machinery. It takes more men and a larger percentage of our entire population to man our factories today than it did a generation ago, and in that length of time we have installed more machinery than any other country in the world has ever possessed.

Advertisers like to know whether or not their advertisements are being read. When inquiring about machines, tools, or equipment advertised in this magazine, please mention MODERN MACHINE SHOP. Your cooperation will help to build up a bigger and better magazine for your own benefit.

Better - Quicker - Cheaper!

Production That's 100% Profitable!

MODERN machine shops require modern equipment! Make top profits and *keep* them! Consider these two popular trucks:

No. 10-G. For Mill Mechanics, Repair and Garage men. Combined workbench and tool stand. Top and shelf of 12 and 16 gauge sheet steel respectively, riveted to heavy angle steel legs. Size 36 in. wide, by 20¾ in. deep by 36 in. high. Six drawers 11⅞ in. wide by 28 in. deep. Top drawers being 1 in. and 2 in. high and three bottom drawers 3 in. high. Locking front slide door over drawers. Casters, at one end only, are 6 in. diameter stationary type. Olive green lacquer finish. Shipped set up and crated.

No. 10-G Tender. All-steel machine tender and tool stand.

No. 3620-33 All-Steel Die Truck.

No. 3620-33 Die Truck. Substantially built to handle heavy dies. 36 in. long by 20 in. wide by 33 in. high. 12 gauge flat steel top with heavy angle steel uprights. Riveted construction; rigidly braced. Four swivel iron wheel casters 5 in. diameter. Finished olive green lacquer. Shipped set up.

Also

SHOP DESKS	CABINETS	TABLES
STOOLS	TOOL STANDS	TRUCKS

Write for 1931 Catalog M-S

ANGLE STEEL STOOL CO. PLAINWELL, MICHIGAN

The Steel Equipment People

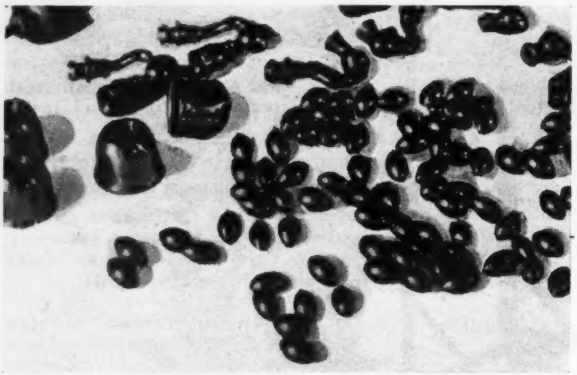
Ideas From Readers

This department is a clearing house for ideas. If there is a "kink" or short cut in use in your shop, send in a description of it. We will pay $5 for each one published.

Oval-Shaped "Balls" For Tumbling

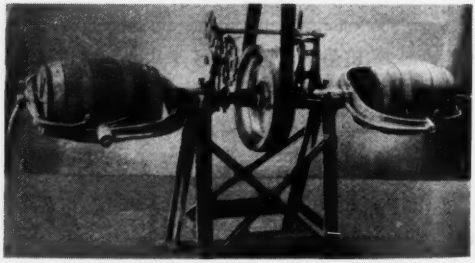
By AVERY E. GRANVILLE

A LARGE manufacturer of parts for atomizers, sprayers, syringes and other instruments made of brass found that the cost of polishing these parts, previous to plating, was too high. The cost of handling such small pieces individually was prohibitive, and the usual methods of tumbling did not give satisfactory results. Steel balls of various sizes were tried, but the larger sizes did not get into the rounded corners, or fillets, of the pieces. The smaller sizes of balls got into the fillets, but apparently didn't have weight enough to polish the metal properly. Sand was tried and discarded.

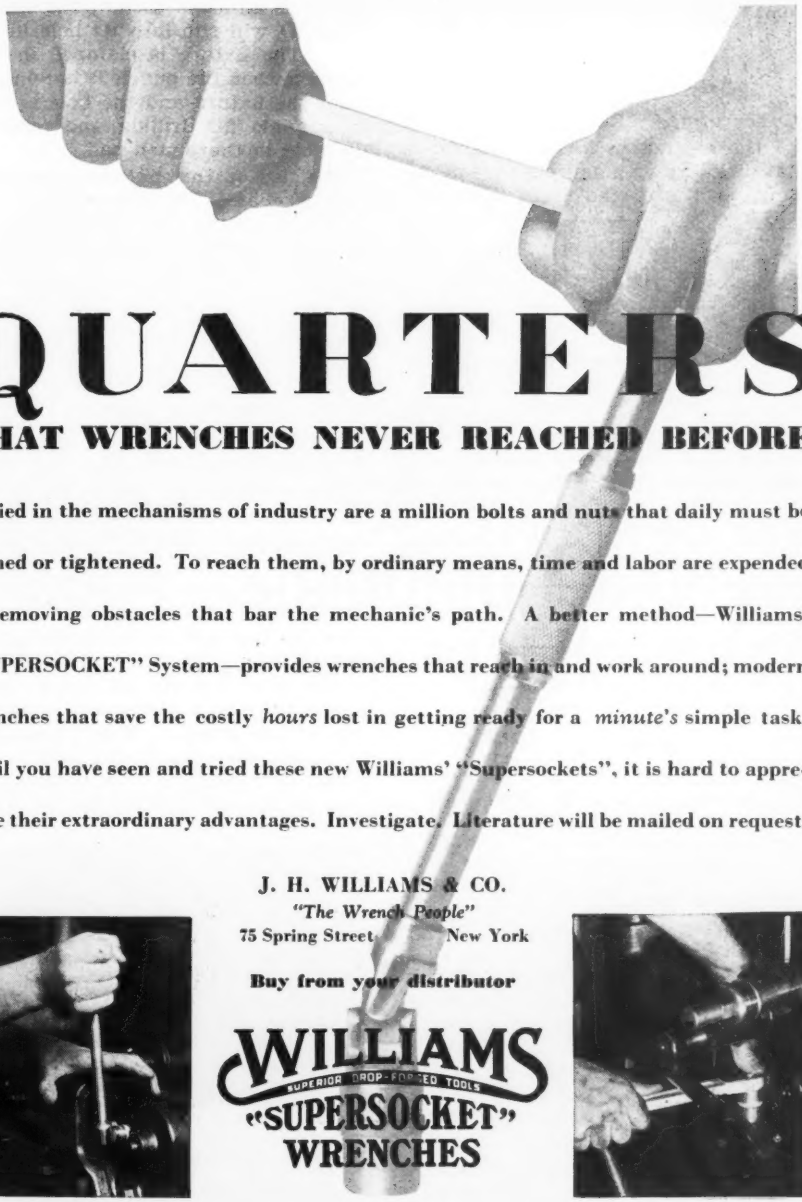


The oval-shaped balls and some of the work they were used to polish

Finally steel "balls" of an elongated, or oval, shape were tried, and solved the problem. Some of these balls are shown in the illustration. As there were no such balls on the market, they had to be made in the shop. This task was accomplished by turning them, in a small automatic lathe, from steel rod of the proper diameter. The brass parts to be polished, together with a good supply of the oval balls, were put into the tumbling barrels shown in the second illustration. Then the barrels were filled almost full of water and half a cake of Ivory soap was thrown in. The drive pulley for the barrels was equipped with a clutch and an automatic throw-out which was set to stop the barrels from turning about an hour after they were started. It is estimated that this method is saving this firm several hundred dollars a month.



Tumbling barrels in which the polishing was done



QUARTERS

THAT WRENCHES NEVER REACHED BEFORE

Buried in the mechanisms of industry are a million bolts and nuts that daily must be turned or tightened. To reach them, by ordinary means, time and labor are expended in removing obstacles that bar the mechanic's path. A better method—Williams' "SUPERSOCKET" System—provides wrenches that reach in and work around; modern wrenches that save the costly *hours* lost in getting ready for a *minute's* simple task. Until you have seen and tried these new Williams' "Supersockets", it is hard to appreciate their extraordinary advantages. Investigate. Literature will be mailed on request.

J. H. WILLIAMS & CO.
"The Wrench People"
75 Spring Street New York

Buy from your distributor

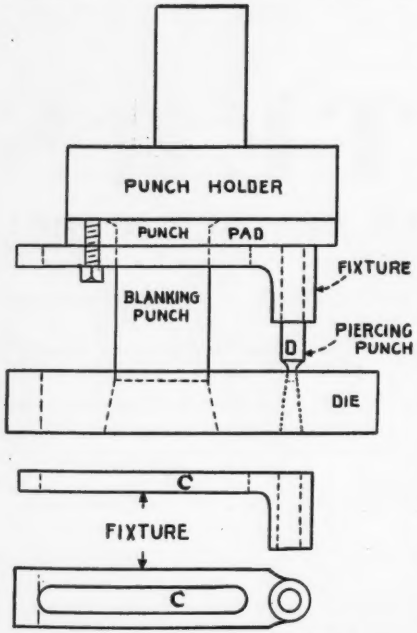
WILLIAMS
SUPERIOR DROP-FORGED TOOLS
"SUPERSOCKET" WRENCHES

WESTERN WAREHOUSE — SALES OFFICE, CHICAGO — WORKS, BUFFALO, N. Y.

Fixtures For Lining Up Punches

By CHARLES KUGLER

ONE of the difficulties with which the die maker has to contend is that of lining up small punches in the punch pad with the die. By using the fixture indicated as **C** in the accompanying illustration, this task is simplified considerably.



Fixture For Lining Up Punches

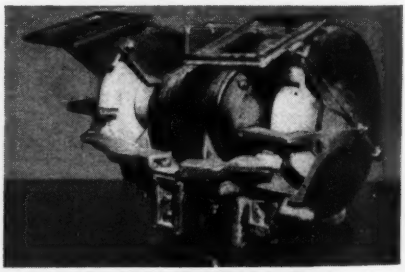
The hole in the fixture is ⅜ in. in diameter, and square with the base. In order to use the fixture, a special punch **D** is made, with a shank that is a push fit in the hole in the fixture, the punch being turned to fit the corresponding hole in the die. With this special punch in place in the fixture, the fixture is attached, loosely, to the punch pad, then the blanking punch is inserted in the die and the fixture is adjusted so that the special punch **D** will slip into its hole in the die. The fixture is clamped in this position, then the punch **D** is removed from the fixture and the hole is used as a guide for drilling and reaming the hole in the punch pad.

The use of this fixture saves time and promotes better work, as the usual peening of the pad and bending of the punches to align them properly are eliminated.

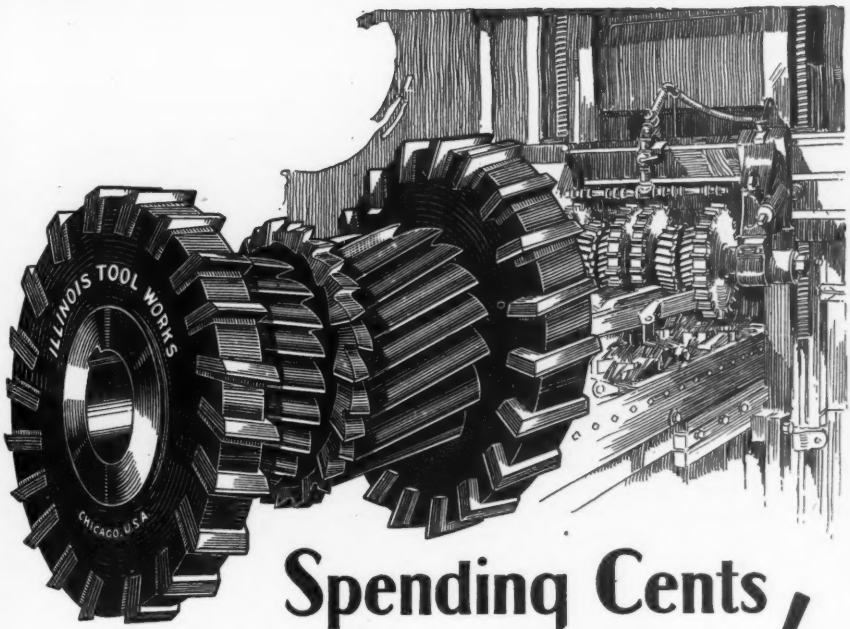
An Adjustable Glass Emery Wheel Shield

By H. H. HENSON

UNDOUBTEDLY there are many emery wheel stands or floor grinders about the country which are as yet unguarded and which could be equipped with adjustable glass shields, as shown in the illustration, at small cost. The glass pane is set into a frame of cast brass or aluminum which is fastened to the wheel guard at the top by hinges. To the side of the frame is hinged a rod which passes through a swivel-clamp on the side of the guard. When necessary to adjust the shield, the rod is released by turning the thumb-screw on the swivel-clamp and is tightened again in the same manner. It may be desirable to raise the shield in



Emery Wheel Stand Equipped With Adjustable Glass Shield



Spending Cents — — — *to Save* Dollars!

THE importance of small tools such as Milling Cutters, Hobs, Reamers, are of such prime importance in unit costs that they should be purchased only on a performance basis.

Illinois Cutters cost no more to buy and cost less to use.

The Illinois Tool Works 256 page Catalog "D" and supplement on Inserted Blade Cutters will be sent free upon request.

"Buy 'Illinois' Metallurgy in your tools"

ILLINOIS TOOL WORKS
2501 North Keeler Avenue · Chicago, Illinois

order to grind a spot on a large piece of work, or to grind lengthwise on a long tool. It will be noted that a stop-collar is attached to the end of the rod to prevent the rod from being pulled out of the clamp. The glass makes it possible to grind tools or work in plain sight without the risk of being struck in the face with flying particles. Grinders which would be otherwise condemned as unsafe may be made usable by the use of this shield.

Making Emergency Bushings

By W. F. SCHAPHORST

WHEN an urgent need arises for one or more bushings, and no standard bushings are available, it is up to somebody to produce an emergency bushing that will serve the purpose. Every old-time mechanic knew how to babbitt a bearing, and those of the later crop *ought* to know. But in these days of standard commercial parts for everything mechanical, it is probable that many apprentices serve their full time without learning how to melt a ladleful of babbitt.

To apply a babbitt or lead bushing, the most important part of the operation consists in supporting the part to be bushed so that the bearing hole is properly located around the shaft. That is, it must be concentric. Then, with putty or any other suitable material, build dams around the opening and arrange the mold so that the metal can be poured. The operation thus far is so obvious that detailed explanation is unnecessary. Then pour the metal just about as indicated in Fig. 1. That's all there is to it.

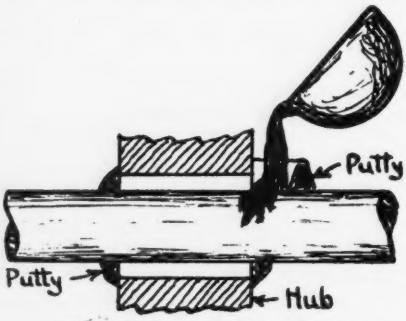


Fig. 1—Pouring a Babbitt Bearing

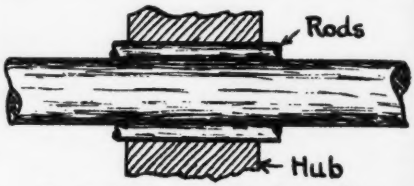
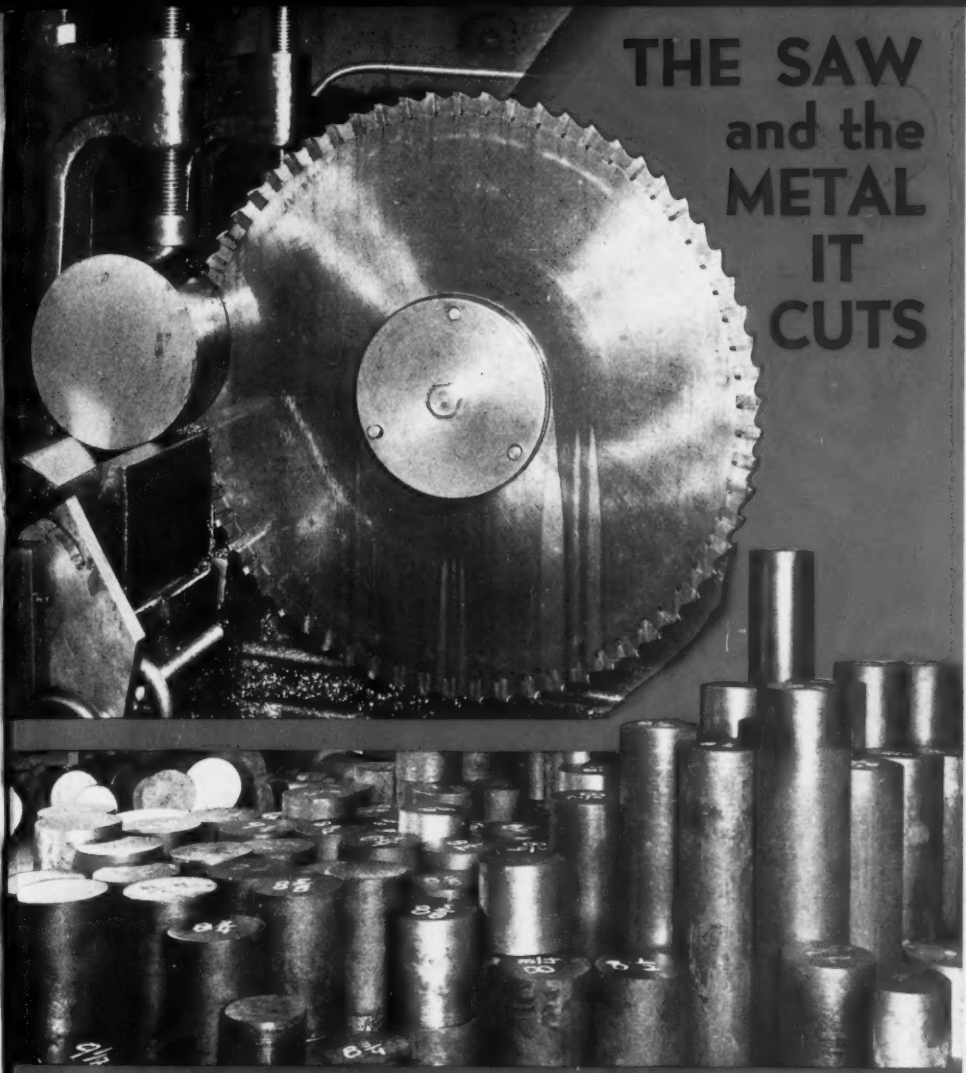


Fig. 2—Making a Bearing Out of Short Pieces of Steel

For split pulleys, if it so happens that the bushing must have a wall of standard thickness, such as ⅛ or ¼ in., and if you have in stock any iron or steel rods of this diameter, cut off pieces slightly longer than the length of the hub or bearing and fill in the space around the shaft with them as shown in Fig. 2. Square or rectangular stock is better for this purpose than round stock, as the round pieces will act like rollers in a roller bearing if the pulley or bearing is not bolted up tight enough to prevent such action. Where strips of hardwood are available, such strips can be used by inserting them around the shaft as described above. Wood is more easily reduced to the proper size than metal, and where there is ample contact surface between the pulley and the shaft, wood usually serves the purpose just as well.

Notwithstanding these days of reduced sales and smaller profits, E. F. Houghton & Company paid their customary service bonus to their employees for the year 1930. The total amount paid out was $21,978.00. The bonus is based on a sliding scale, 2 per cent of the total wages being paid as bonus for the first year, 3 per cent for the second year, and up to 8 per cent from the tenth year on.



THE SAW and the METAL IT CUTS

This picture illustrates a No. 0 - 32″ Simonds RED STREAK Inserted Tooth Saw in the plant of Passman Bros. Co. of Chicago. It is cutting through a 10½ inch hydraulic ram, 10 - 30 S. A. E. straight carbon Steel. Fifteen minutes were required to complete the cut on first feed. The accompanying illustration shows the kind of stock being cut in this plant, the various sizes being marked on the bar ends.

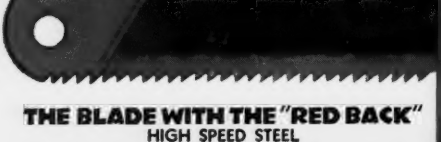
If you have a metal cutting problem write Simonds Engineers for information.

SIMONDS SAW and STEEL CO.

"World's Largest Saw Makers"

ESTABLISHED 1832 FITCHBURG, MASS.

THE BLADE WITH THE "RED END"
TUNGSTEN STEEL



THE BLADE WITH THE "RED BACK"
HIGH SPEED STEEL

SIMONDS

"RED STREAK" HACK SAWS

cut fast..easy and true!

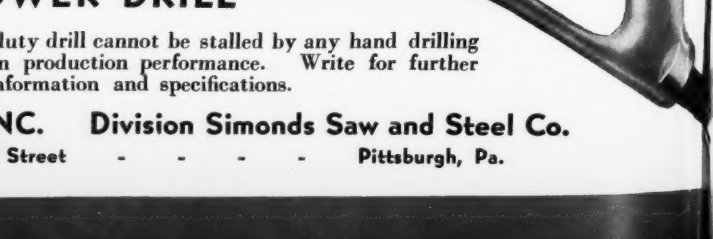
When you buy Hack Saw Blades look for these brilliant RED Trade Marks—

"RED END" for Tungsten Steel
"RED BACK" for High Speed Steel

Ask any leading hardware or supply dealer

SIMONDS SAW AND STEEL CO
"The Hack Saw Makers"
ESTABLISHED 1832 — FITCHBURG, MASSACHUSETTS
Branches throughout the United States and Canada

NEW WAPPAT RED STREAK SPEED POWER DRILL



This ¼ inch heavy duty drill cannot be stalled by any hand drilling test. It is ideal in production performance. Write for further information and specifications.

WAPPAT, INC. Division Simonds Saw and Steel Co.
7522 Meade Street - - - - Pittsburgh, Pa.

Now that the exterior of the new Simonds ultra-modern factory is completed, work of laying special foundations for heavy machinery, is in progress. The most up-to-date equipment is to be installed. This will help lighten labor and create the best possible working conditions.

* * *

New Dealers are regularly being added to the list of those handling and recommending Simonds Red End tungsten alloy steel hack saw blades and Simonds Red Streak high speed steel blades. Tell your dealer to join the crowd.

* * *

Industrial leaders from the United States and Canada have shown enthusiastic interest in the Windowless factory. Many have visited the plant and observed the progress being made in the building. From all parts of the world have come inquiries for information about the new Simonds plant.

* * *

A large Connecticut manufacturer, using Red Streak High Speed Steel Hack Saw Blades sends us a report as to the fine work these blades are doing. In cutting Carpenter No. 189 die drawn steel, a blade made 60 cuts through a 4¾" round bar and 12 cuts through a 5¾" round bar. The previous best record with other blades was 6 to 10 cuts on 5¾" round stock. To make these cuts the latter blades had to be resharpened.

* * *

Red Streak Hack Saws, Inserted Tooth Metal Saws, Slitting Saws, Files, Tool Bits and ground flat stock are some of the Simonds products to be manufactured in the new Windowless factory.

* * *

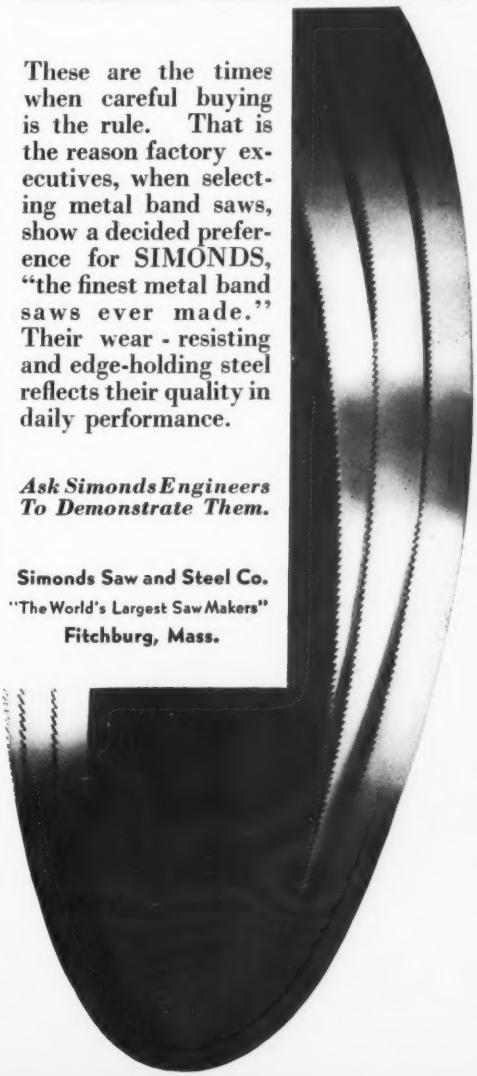
The Windowless factory will have a lighting system which has been conceived by foremost engineers of the General Electric Co. Scientists say that this method of lighting, to be installed in the Simonds factory, will eliminate shadows and cause a more uniform distribution of light rays to every portion of the building. This is expected to prevent accidents and possible injury to men working on machines.

Not Just Saws, But SIMONDS Metal Bands

These are the times when careful buying is the rule. That is the reason factory executives, when selecting metal band saws, show a decided preference for SIMONDS, "the finest metal band saws ever made." Their wear-resisting and edge-holding steel reflects their quality in daily performance.

Ask Simonds Engineers To Demonstrate Them.

Simonds Saw and Steel Co.
"The World's Largest Saw Makers"
Fitchburg, Mass.



KEEP PRODUCTION LINES MOVING

Production lines just have to keep moving; grinding wheels must hold up on the corners, grind freely and leave a high, uniform finish.

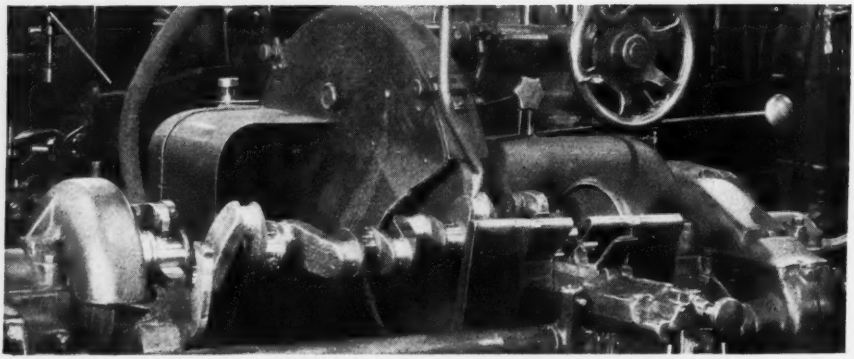
Abrasive Company wheels are showing a consistent and accurate rate of production on crankshaft grinding where both time and accuracy are important.

Write for illustrated folder "Cylindrical Grinding" containing valuable information on this operation.

ABRASIVE COMPANY

Divison of Simonds Saw and Steel Co.

Tacony and Fraley Streets **Philadelphia Pa.**



Abrasive Co. Grinding Wheels

Over the Editor's Desk

The Big Problem

IT IS significant that, of the discussions of various topics that occupied the attending members of the National Metal Trades Association at their Thirty-Third Annual Convention in Cincinnati, last month, a large part was devoted to possible and probable causes of the recent depression and suggestions for the prevention of its recurrence. The industrial leaders of America are unanimous in agreeing that here is a real and concrete problem—a problem which is just as important to them as any of the problems connected with the manufacture of their individual products. And the problem is theirs to solve, for the fate of civilization depends upon its industries—not upon its banks, merchandising establishments, or other institutions.

Responsibility for the hard times of the past year and a half has been placed variously upon over-production and the development of labor-saving machinery. It is ironical to charge that we have over-produced when thousands of people are destitute for food, clothing, and the other necessities of life. The farmers have raised so much grain that the government has tried to help them out of their difficulties by taking the surplus off their hands, while every city and town in the United States has been put to the necessity of feeding a large share of its population. Thousands of people need food—while the government doesn't know what to do with its wheat. Thousands of people need clothes—and the textile industries are idle. It is charged that we are suffering from an over-production of automobiles, radios, washing machines, furniture, and other commodities, while there are still many thousands of people in need of all of these things in this—the richest nation on the face of the globe. The situation is at once ridiculous and heart-breaking.

The charge that the use of high-production machinery is responsible is well answered in the paper by Franklyn Hobbs, reproduced on page 40 of this issue. Mr. Hobbs points specifically to the fact that we have, in the last thirty years, installed twice as much labor-saving machinery as England, and it is a matter of common knowledge that a large percentage of the English population lives continuously on government doles. In countries where practically no labor-saving machinery is used, such as India and China, the standard of living for the laborer is pretty well toward the bottom of the scale, in addition to which the number of street beggars is practically unlimited. During these thirty years the production per worker has been doubled and tripled by the development of labor-saving machinery, yet the living standards of the American people have risen steadily. Mr. Hobbs says that the labor-saving machinery that has been installed in these last three decades has been sufficient to replace as many workers as there are people on the North American continent, so if machinery actually creates unemployment, there would be no one working at all.

Having undertaken to find the cause of our periodical depressions, it is probable that our national leaders will stick to the job until it is finished. But labor-saving machinery will be vindicated.

New Shop Equipment

Natco Two-Way Horizontal Hydraulic Drilling Machine

The illustration shows a new type of machine which has been developed by The National Automatic Tool Co., Richmond, Indiana, for drilling the cam shaft hole in cast iron cylinder blocks. The machine consists of two horizontal sliding heads mounted on a single piece bed. It is fully automatic in operation, including the indexing of the trunnion and the clamping and releasing of the pieces in the fixture. The operator is required only to slide the pieces in and out of the fixture.

Hydraulic pressure for moving the heads and indexing the fixture is supplied by a 10 h. p. motor through a silent chain drive. Each head has a thrust of approximately 20,000 lb. with a travel of 21 in., and is equipped with a fixed-center gear-driven cluster box containing four heavy duty spindles with nose adjustment. The spindles are 3¼ in. in diameter, are roller bearing-mounted, and are driven by a 15 h. p. constant-speed motor. A six-position, trunnion type, roller bearing-mounted, automatic fixture having an automatic clamping and releasing device arranged to hold one part in each position is furnished with this machine. The fixture is indexed mechanically by movement of the left-hand head.

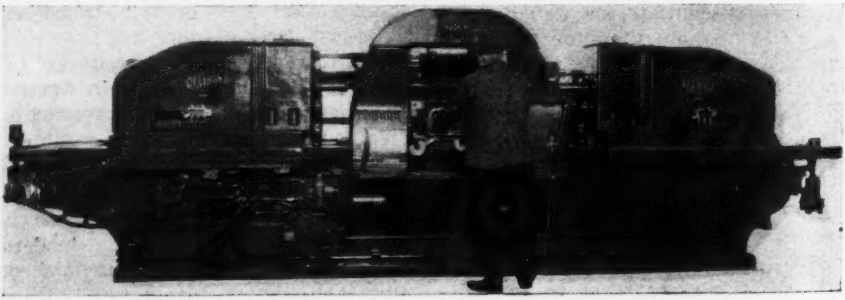
The operations performed on the cylinder block are as follows:

Station No. 1; loading station. Station No. 2; right-hand head drills through outer wall with 15/16 in. drill. Left-hand head drills through outer wall with 15/16 in. drill. Station No. 3; right-hand head drills outside wall part way with 1 17/32 in. drill. Left-hand head drills outside wall with 1 17/32 in. drill. Station No. 4; right-hand head drills center wall with 15/16 in. drill. Left-hand head is idle. Station No. 5; right-hand head is idle. Left-hand head drills center wall part way with 1 17/32 in. drill. Station No. 6; right-hand head drills outside wall through with 1 17/32 in. drill. Left-hand head drills center wall through with 1 17/32 in. drill.

The production possible with this equipment is approximately 75 pieces per hour. The weight of the machine is approximately 47,000 pounds.

Hammond Universal Automatic Polishing and Buffing Machine

Polishing and buffing operations, which in the past have been mostly hand work on a one-piece-at-a-time basis, can now be handled automatically and on a production basis by the use of the Universal Automatic Polishing and Buffing Machine, which has been developed by the Hammond Machinery Builders, Kalamazoo, Michigan. The machine consists primarily of a cylindrical-shaped bed, on the top of which is a circular



Natco Two-Way Horizontal Hydraulic Machine for drilling cam shaft hole in cylinder block

NEW

HIGH-SPEED SENSITIVE ADJUSTABLE MULTI-SPINDLE DRILLER and TAPPER

Illustrated is a Model D-5 NATCO Multiple Spindle Driller and Tapper. It is a small "Multiple" equipped with a 10-spindle head, spindle speed change gears, reversing vertical motor drive and may be arranged with either a hand or foot operated table feed. Machine has a capacity of ten 1/4" drills or ten 3/16" taps in cast iron. Write for complete information on this new "High Speed Sensitive NATCO Multiple."

"NATCO Solves Your 'Hole' Problem"

THE NATIONAL AUTOMATIC TOOL CO.

RICHMOND, INDIANA, U. S. A.

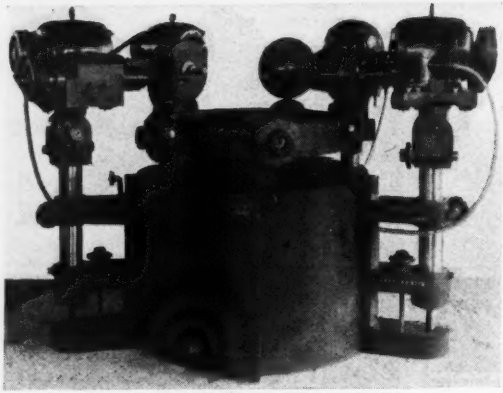


Fig. 1—Hammond Universal Automatic Polishing and Buffing Machine

work-table, and with individually motor-driven buffing or polishing wheels located at evenly-spaced points about the bed.

The table is so designed that it can be equipped with work-holding devices of various kinds, for flat or round work, and can be made to revolve continuously at a given rate of speed, or it can be made to index automatically at regular intervals. If desired, the table will index automatically and, while stopped in working position, each piece of work can be revolved so as to present a complete circular surface to the polishing wheel. The work located at the loading station, however, will not revolve, thus giving the operator an opportunity to change pieces. The machine is shown set up for such an operation in Fig. 1.

Each polishing wheel spindle is mounted, together with its motor, on an adjustable base on a column that can be adjusted to any height or position necessary to bring the wheel to the desired position. The base can be tilted to any angle from horizontal to vertical and, as the four wheel spindles and motors are independent, the wheels can be adjusted to four different positions, if desired, thus making it possible to buff or polish four different sections of the work-piece as shown in the upper part of the illustration, Fig. 2. The polishing wheel spindles are driven by multi-V belts, and the speeds can be varied through different diameters. In order to obtain the "cushion" effect considered necessary for polishing, the polishing heads are spring balance - controlled so that any predetermined pressure may be obtained. The spring is simple of adjustment.

Straight line polishing within certain length limits is handled by the use of platens which feed toward center as the table stops after indexing, and then reverse to starting position. In the lower part of the illustration, Fig. 2, platens are shown in use for polishing flat iron bases. A more accurate job and better finish can be obtained as the bases pass under these four wheels than could possibly be obtained by hand, and the machine makes possible a greater production per operator. The table can be adjusted to produce up to 2,000 pieces per hour, if required, depending on the work.

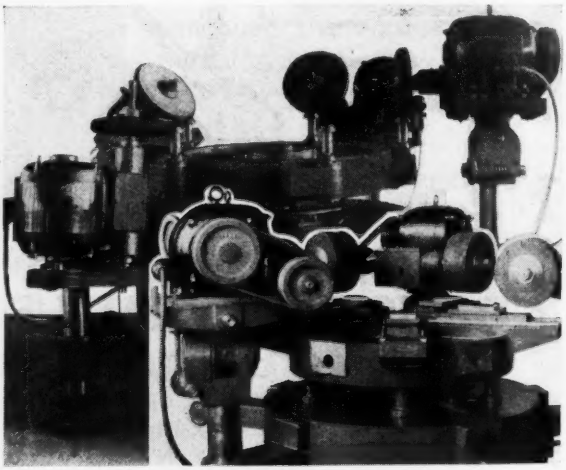
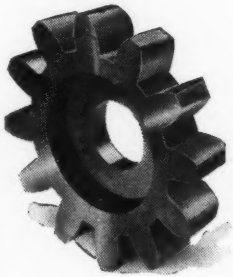


Fig. 2—(Upper) Polishing a flat vertical surface, a 20-deg. bevel, a 90-deg. corner, and a flat horizontal surface in one operation. (Lower) Polishing flat iron bases by means of platens which feed across under the wheels



A LABORATORY PRODUCT

Made On a Production Basis; Sold At a Fair Commercial Price

WERE it not for the development of special automatic machinery, original Fellows Gear Shaper Cutters would cost you much more than you now pay for them. It has taken years of research and experience to develop this special manufacturing and inspection equipment necessary to make this laboratory product on a production basis.

Most of the progressive manufacturers have standardized on Original Fellows Gear Shaper Cutters for original equipment and replacement purposes. They have found that it pays. Saving a few cents on Gear Shaper Cutters may cost you much more in trouble and spoiled work. For your own protection and profit use nothing but Original Fellows Gear Shaper Cutters on your Fellows Gear Shapers.

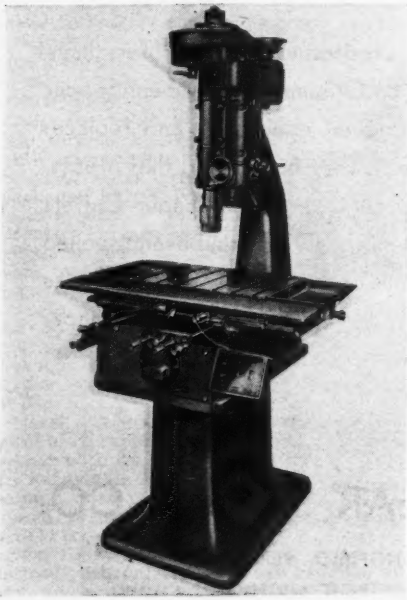
THE FELLOWS GEAR SHAPER CO.

78 RIVER STREET, SPRINGFIELD, VERMONT
616 FISHER BUILDING, DETROIT, MICHIGAN

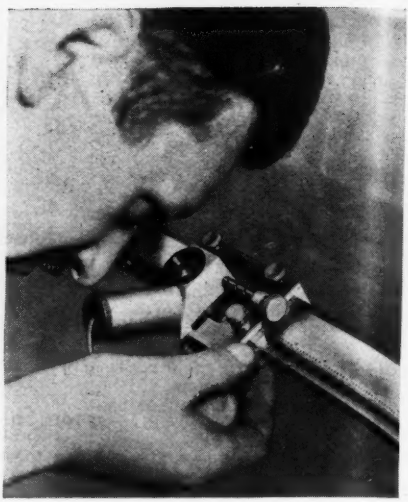
The machine is equipped throughout with anti-friction bearings, and the entire base is dust-proof. The magnetic switches for motors, table drive motor, and gearing for the table motion are located inside the base. Safety stop and start buttons are located at front and rear of the machine. Guards for the V-belts and exhaust hoods are provided as standard equipment. The spindle bearings have a self-contained oscillating feature controlled by a lever on the outside of the bearings. The worktable is mounted on anti-friction bearings, dust proof, and is indexed by means of a well-designed Geneva motion. The faces of the wheels can be redressed with composition at proper intervals, this operation being handled either manually or automatically and controlled from the operator's station.

Kellocater Jig Boring Machine

The Keller Mechanical Engineering Corporation, 84 Front Street, Brooklyn, N. Y., announces the Kellocater Jig Boring Machine shown in the illustration. This machine is intended for fast, low-cost jig boring and layout work. The design of the machine incorporates a number of new features which reduce the possibility of mechanical error to the minimum.



Kellocater Jig Boring Machine



Setting the Vernier

The only measuring device on the machine is the vernier scale. One scale is used to measure the longitudinal movement, and another to measure the transverse. The dimensions are read directly from the scale through a ten-power, flat-field magnifying glass, equipped with a built-in electric light, free from any possibility of visual distortion. Settings are easily made, without moving work or table, by aligning two sharply drawn graduations, the one on the scale and the other on the vernier. This construction enables the operator to read his exact position at a glance, and eliminates the use of several measuring elements. The operator's problem is reduced to the mere adjustment of a light and sensitive instrument, rather than the positioning of a considerable mass at precise location. In connection with setting, an adjustable screw is provided so that the scale and vernier can be lined up to the nearest even inch, eliminating the necessity of adding or subtracting decimals or fractions in determining successive locations. The decimal can be read from the blueprint and the vernier set accordingly.

Perhaps the most interesting feature of the machine is the electrical step by which location becomes automatic. By

Before You Buy Another Diamond Dresser

Try this one

The sectional view shows the radically different multiple mounting of KOEBEL Diamond Dressers. These tools are made in three-set, four-set, or five-set tools to meet all requirements.

YOU'LL find the KOEBEL Multi-Set Diamond Dresser radically different in design . . . yet extremely practical and economical in use.

Instead of using one large diamond which must be remounted time and time again . . . the KOEBEL Mulfi-Set Diamond Dresser has several small, tested, quality diamonds mounted in one tool. The KOEBEL Method (patents pending) of entirely surrounding the diamonds with a newly developed metal insures a mounting that holds the diamond rigidly in place and protects against loss until it is completely used up.

This idea saves you money because KOEBEL Multi-Set Tools cost less, eliminate resetting charges, reduce handling costs and lower loss from unintentional abuse. Get the whole story—send for illustrated folder and price list.

KOEBEL

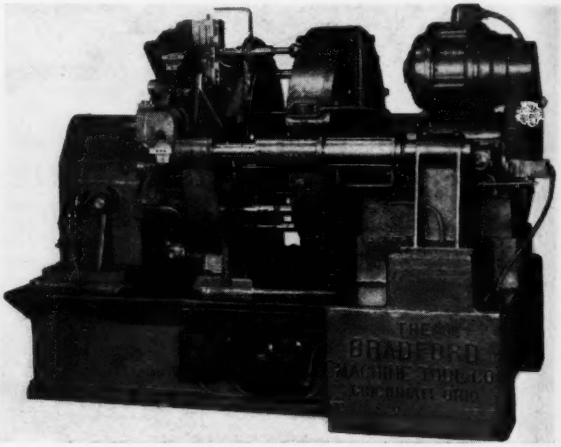
KOEBEL-WAGNER DIAMOND CORP.
144 Orange Street, Newark, N. J.
Detroit Indianapolis Chicago
Cleveland New York

Multi-Set Diamond Dressers

snapping a toggle switch, the machine is actuated to move at uniform speed by means of a magnetic clutch-driven lead screw. As the contact attached to the table touches the anvil of the vernier slider, the magnetic clutch releases the lead screw and the table stops in location within an accuracy of 0.0002 inch. A lock which has recently been perfected prevents the table from slipping, thereby keeping the fine accuracy of the setting intact.

By using the automatic reversible spindle feed, the operator can bore one hole while setting for the next one. A quick-change collet of new design provides for quick changing of tools. The large, extra heavy chrome nickel steel spindle, running in high precision ball bearing, insures accuracy. Eight spindle speeds — from 77 to 1750 r. p. m. — are available; four through open belt and four through back gears. There are two reversible automatic feeds—0.002 in. and 0.005 in. An automatic positive depth stop with scale and pointer is attached to the spindle head.

The driving mechanism of the machine, including the magnetic clutch, is enclosed and protected in a rigid box-shaped bed. The spindle drive motor is mounted on a sturdy hinged bracket, easily adjustable for belt tension. The working surface of the table is 14 x 21 in.; table travel, horizontal, 18 in., transverse, 12 in.; table top to spindle end, 2½ in. min. to 14½ in. max.; dimension from spindle center to face of column, 14 in.; vertical adjustment of spindle bracket, 6 in.; spindle quill travel, 6 in.; dimensions, 55 x 45 x 78 in. high; weight 1375 pounds.



Bradford Machine for drilling, reaming, and facing golf club heads

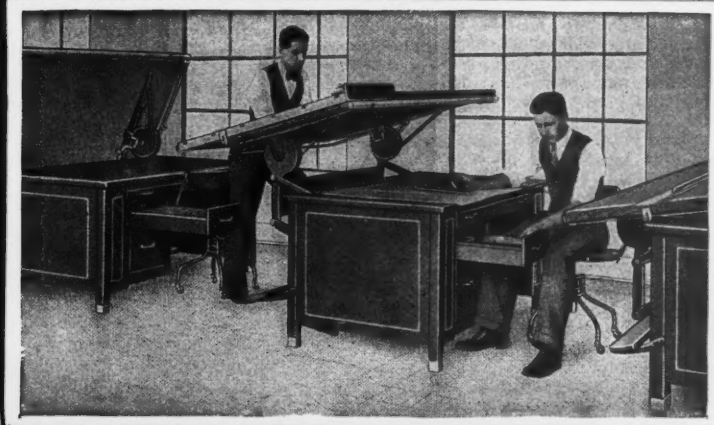
Bradford Machine For Drilling, Reaming and Facing Golf Club Heads

An automatic horizontal drilling machine has been developed by The Bradford Machine Tool Company, 657 Evans Street, Cincinnati, Ohio, for drilling, taper reaming and facing the end of the socket on a golf club iron. The machine consists of a standard Bradford Automatic Drill Unit equipped with a seven-spindle multiple spindle drill head with the tools set 45 degrees apart on a 24 in. diameter circle. This is arranged to work in conjunction with an eight-station Ferris-wheel type drum.

The fixture at each station consists of an equalizing two-jaw chuck in which provision is made for adjustments in six different directions in order to compensate for variations in the different designs and sizes of the golf club irons, also to take care of variations in the pitch of the irons and variations that may occur in the forging dies used for irons of the same style. This multiplicity of adjustment makes it possible to handle every type of golf club iron in this machine with a minimum change of time for set-up and the elimination of extra loose parts or adapters.

The work of the operator is limited to loading and unloading, as all functions of the machine are fully automatic. The control of the machine is centered in the motor that operates the index movement. This motor is mounted at the back of the machine and is connected to the index control by means of a spur gear and a worm gear drive which rotates the control cam shaft at a speed of 5.8 r.p.m. The indexing movement requires one second to complete and the design of the cam is such that the acceleration of the drum at the beginning

THE AUTO-SHIFT



DRAWING AND REFERENCE TABLE

THIS new table is practically automatic in all its adjustments. Any position of top obtained in five seconds. A handsome, steel desk mounted with a super-adjustable, full-floating, counter - balanced drawing board which is equipped with a tool holder for vertical work and a built-in pencil ledge at the front.

The large desk - reference-surface, reference drawer and tool drawer provide ample working facilities. Use the coupon.

HAMILTONIZE and ECONOMIZE

Hamilton Mfg. Co.
Two Rivers, Wis.

HAMILTON MFG. CO., Two Rivers, Wis.
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and the finish of the index movement is accomplished without perceptible shock.

As the indexing movement is completed, an auxiliary cam on the cam shaft actuates a single-acting air control valve, shown at the left front of the machine. This causes the feed mechanism of the drilling unit to be thrown into engagement and the spindles advance in rapid traverse for a distance of 2½ in., slow down to a feeding stroke of .008 in. per revolution, then return in rapid traverse to the starting point. The machine is timed to operate on a cycle of 10½ seconds, but the actual time required for loading and unloading the fixture is less than six seconds. Consequently the operator has ample time to inspect his work as required.

The machine is equipped with a safety device, so arranged that in the event that the tools become excessively dull or unforeseen circumstances prevent the forward travel of the head, the entire machine will stop.

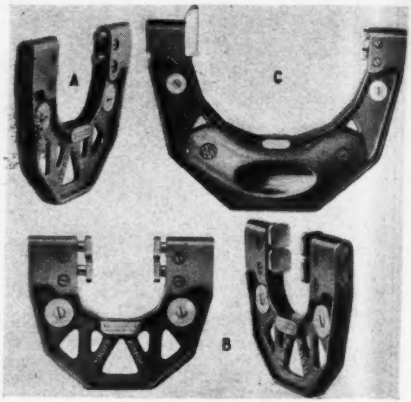
The coolant supply system consists of a low pressure pump operated by an individual motor, connected through suitable piping to project a jet of coolant directly into the hole at each stage. The electrical control is centered in a single push button, but each motor is equipped with individual switches having underload and overload protection. When in operation, the Ferris-wheel drum is totally enclosed with suitable splash guards.

While this machine is tooled up specifically for the production of golf club irons, the same machine can be adapted, changing the workholding fixtures and the cutting tools, to the production of any similar part requiring a multiple of operations at one plane.

Pratt & Whitney Models C, B, and A Adjustable-Limit Snap Gages

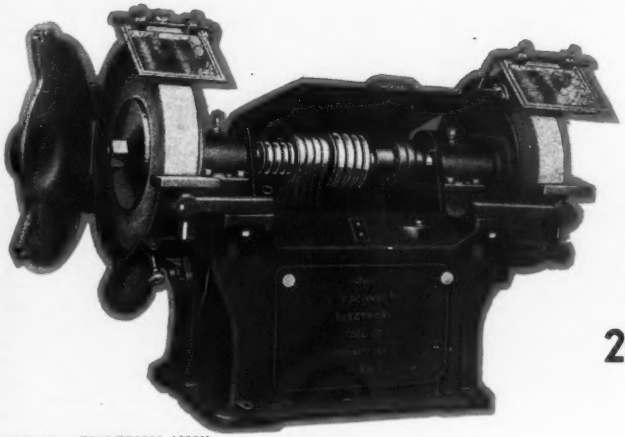
The Pratt & Whitney Company, Hartford, Conn., has placed on the market three new styles of snap gages, known as the Model C, Model B, and Model A gages. All three are of the "Trusform" style, which has been the Pratt & Whitney standard for several years. The frame is made in the form of a bridge truss, with the outer and inner ribs flanged to produce the same strength and rigidity as would be present in a built-up bridge girder. The web between the flanges is comparatively thin, with the struts placed at the necessary stress angles to produce rigidity and to eliminate all possible weight.

The Model C gage is made with one solid anvil and two adjustable anvils, as shown in the illustration. This type of gage is equipped with a Bakelite grip on either side to insulate the frame from the heat of the operator's hand, as well as to facilitate handling. In using the Model C gage, the solid anvil is inserted on top of the work and the gage is rocked into gaging position. This method of using a snap gage brings all the wear on the broad, solid anvil surface, and eliminates the tendency to force the gage into contact.



P & W Adjustable-Limit Snap Gages

The solid anvil is held rigidly in place in the frame by two screws. It projects beyond the end of the frame and beyond the adjustable anvils, which permits it to locate itself quickly on the work. In addition, the solid anvil is made flush with the side of the frame to permit the user to check close to a shoulder. The adjustable anvils of the Model C gage have rectangular heads and are made of high grade tool steel, heat treated and lapped flat and square with the shank. The anvils are interchangeable, and are adjusted by push and pull screws engaged in threaded holes in both the anvil and the frame. The screws have right- and left-hand threads, 40 threads per inch, so that a single turn of a screw will advance or withdraw the anvil 1/20 in. The setting can be made with an ordinary screw driver. The locking device for each adjustable anvil comprises two bushings



"THE CINCINNATI" High-Speed Snagging Grinder with hood open showing three-speed spindle and "V" Belt Drive. Equipped with 10 h. p. motor.

Increase Production 20% to 30% WITH

The Cincinnati HIGH-SPEED SNAGGING GRINDERS

HIGH-SPEED grinding wheels are being used more and more throughout industry . . . but they must be operated at the proper peripheral speeds to obtain economical results. "THE CINCINNATI" High-Speed Snagging Grinder maintains an efficient grinding speed—8,000 to 9,500 s.f.m.—at all times.

Three spindle speeds are available. 24"x3"x12" high-speed wheels are used and operated at a spindle speed of 1,500 r.p.m. When the wheels are worn to 21" diameter the spindle speed is quickly changed to 1,800 r.p.m., again obtaining a peripheral speed of approximately 9,500 s.f.m. Once more when the wheels reach 18" diameter the spindle speed is changed to 2,100 r.p.m. and the wheels may be used almost down to the flanges. A safety device prevents overspeeding or underspeeding.

"THE CINCINNATI" High-Speed Snagging Grinder *will* increase your production. Facts prove it! Let us show you . . . send the coupon!

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Division of
The R. K. LeBlond Machine Tool Co.
2708 Madison Road
CINCINNATI
OHIO

THE CINCINNATI ELECTRICAL TOOL CO.
Cincinnati, Ohio.
Send complete information on "THE CINCINNATI" High-Speed Snagging Grinder to:

Name.....
Firm.....
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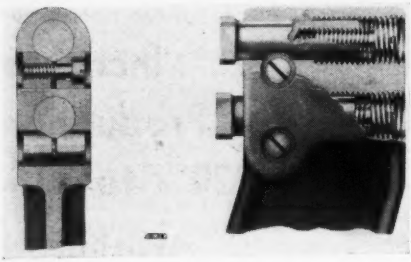
City and State..... MMS-5

and a locking screw. Each bushing is beveled, and each bears against one of the two flat surfaces on the anvil. Tightening the locking screw holds the anvil solidly in position, but does not disturb the accuracy of the gage.

The Model B gage differs from the Model C in that four square adjustable



Anvil adjustment and lock for Model C Trusform Snap Gage

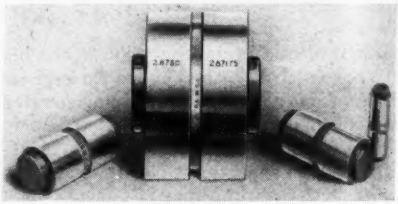
anvils are used. These anvils are so placed in the frame that the gap between them is too small to allow work to drop between. The width of the anvils permits checking to a shoulder. The anvil adjustment and locking devices for the Model B and Model A gages are the same. The anvil is positioned by using size blocks and is held in place with the same locking device as that used with the Model C gage.

The Model A gage differs from the others in that it has four round anvils with much smaller contact surfaces and is intended for use on gaging where a more sensitive "feel" is necessary. The adjusting and locking screws on all gages are below the surfaces of the frames and can be sealed with wax after setting, to prevent tampering. The Model C gage is made in 15 sizes, providing a gaging range of from 0 to 12 in. The Model B gage is provided in 8 sizes, to gage from ⅛ in. to 5 in. The Model A gage is made in 8 sizes, to gage from 0 to 5 inches.

P & W Setting Plugs For Adjustable-Limit Snap Gages

The illustration shows a variety of "setting plugs" that have been brought out by Pratt & Whitney Company, Hartford, Conn. The plugs are intended for use in setting snap gages quickly to previously-fixed dimensions or for checking the settings, and each plug combines the "Go" and "No-Go" in one piece. It is said that a great deal of time can be saved when a number of snap gages are to be set to the same dimensions for large production runs and rechecked periodically.

These setting plugs are made by the same process and to the same standards of accuracy as the Pratt & Whitney cylindrical gages. The plugs are made of high speed steel and are ground and machine lapped carefully to size. Plugs



P & W Setting Plugs for Adjustable-Limit Snap Gages

1 in. in diameter and larger are made from Triblock blanks, with the separate members held solidly by screws and separated by a washer of smaller diameter.

TAPPING?

For only a few dollars, a **"Procunier"** reversible tapping head converts your drill press into a sensitive tapping machine.

Our brand new cork clutch reversible tapper (illustrated) taps perfect holes at 1 to 2,000 R. P. M. or better.

Capacity 0 to ½-inch—Price only $45.00

Send for details and free trial offer.

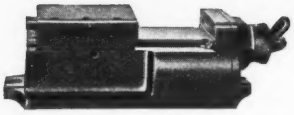
"Pro" tappers frequently tap ¼ to ½ million holes before even the clutch is replaced.

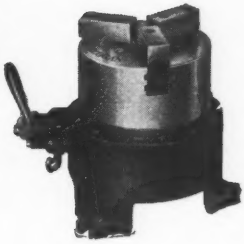
Here's all the "Pro" steel clutch tappers cost complete with our new style tap holder:

No. 1—¼-in Capacity; Safety $28.00; Positive $22.00
No. 2—½-in Capacity; Safety 34.00; Positive 28.00
No. 3—⅝-in Capacity; Safety 40.00; Positive 34.00
No. 4— 1-in Capacity; Safety 52.00; Positive 46.00

PROCUNIER SAFETY CHUCK CO., 12 So. Clinton St., Chicago, Ill.

AIR





Is An Invisible Workman In Your Shop

IS IT an idle workman . . . . or are you using LOGAN Air Operated Devices to eliminate waste in time, effort and motion?

Take, for instance, the LOGAN Devices shown above. All that is necessary with the drill press, or several models of vises, is to place the work between the jaws, actuate the control lever and the work is held **instantly** in a sure grip, without chance of slipping. There is no lost motion.

The LOGAN Arbor Press has sufficient power for practically every arbor press job, combined with a speedy ram movement which gets the job finished quickly.

There's a LOGAN Device to meet every requirement . . . . . cylinders . . . . . chucks . . . . . valves . . . . . etc. Catalog S-25 describes them all. Get your copy today.

THE LOGANSPORT MACHINE CO.

LOGANSPORT, INDIANA

DESIGNERS AND MANUFACTURERS OF AIR-OPERATED DEVICES FOR EVERY WORK HOLDING REQUIREMENT AS WELL AS MANY OTHER PURPOSES.

"LOGAN"

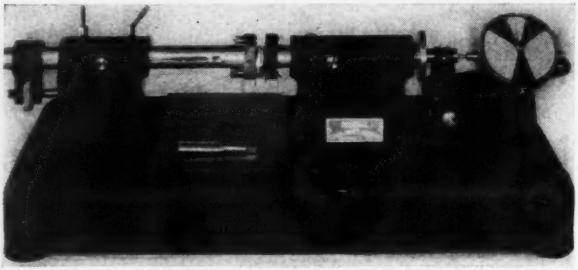
Plugs smaller than 1 in. are made solid, with both gaging dimensions in one piece.

All setting plugs have an insulator on each end so that the heat from the operator's fingers will not affect the gaging size. These insulators are colored to identify the gaging diameters; red for the "No-Go" end and green for the "Go" end. Setting plugs are finished to size as required.

Federal Model 456 Thread Pitch Gage

The instrument shown in the illustration is the Federal Model 456 Thread Pitch Gage which is now being marketed by the Federal Products Corporation, Providence, R. I. The manufacturers state that this gage was originally conceived by the engineers of the J. M. Carpenter Tap & Die Co., Pawtucket, R. I. The gage is intended for use in checking taps, screws, thread gages, and other threaded tools or parts.

The gage uses the "three-wire" method of measuring, by which an accurate measurement can be obtained regardless of error at the top or bottom of the thread. The dial indicator is 3⅝ in. in diameter. The dial is graduated in ten-thousandths of an inch, is calibrated 0—5—0, and is equipped with a tolerance shutter which makes it extremely easy for the operator to take readings closer than ten-thousandths if desired. The anvils are held in contact with the work by spring pressure of from ½ to 6 lb., which can be adjusted to suit, and the tailstock is equipped with a vernier adjustment. The work may be checked vertically or horizontally, as desired. The gage is also made so that it can be operated either by hand or foot, by means of the small lever shown at the right in the illustration.

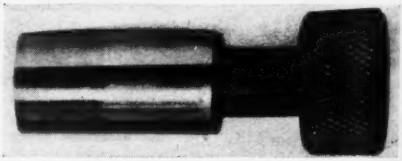


Federal Model 456 Thread Pitch Gage

The wires, one of which is floating and the other two semi-floating, can be changed instantly. The overall length of the gage is 24 in., and the approximate weight is 200 pounds.

Van Keuren Utility Plug Gage

A combination straight and taper plug gage for measuring when finishing holes to size by lapping, grinding or boring has been developed by The Van Keuren Co., Watertown, Mass. The essential feature of this gage is that a predetermined taper of .010 in. in ½ in. length is ground on the front or entering end of the plug,

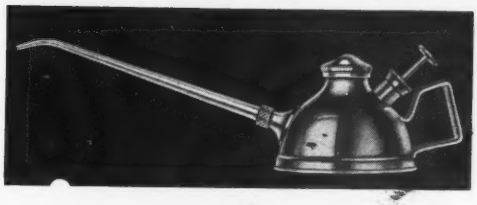


Van Keuren Utility Plug Gage

the remaining portion being precision-lapped to the desired size of the hole to be finished.

In finishing a hole, the distance that the plug enters tells the workman how much stock remains in the hole and just how much of a cut is required to bring the hole to finish size. If the plug just enters, there is .010 in. to be removed. If it enters to a point half way up on the taper, there is .005 in. to come off, and three-fourths of the way shows a surplus of .0025 in., or the distance on the taper may be measured with an inch scale divided in 20ths, each 1/20 inch corresponding to an increase of .001 in. on the taper portion.

A short knurled grip is provided rather than the long standard gage handle, in order that the plug may be used while the work is in the machine and without moving the cutting tool any great distance. The gage is available in standard fractional sizes from ¼ in. to 1 in. and also in special sizes. If desired it may be used as a "Go" member in a standard American Gage Design Handle, with a "No-Go" unit on the opposite end.



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for INDUSTRIAL USERS

There's more than one reason for trusting every light oil task to 3-in-One. It flows quickly to all friction points. It distributes evenly. It stays where it's needed. And it "stands up" to its job—even at the speed of 10,000 r.p.m.

To provide such complete protection 3-in-One is blended from *animal, mineral* and *vegetable* oils by a special process. That's why no plain mineral oil can serve high speed purposes as well.

From your supply house, or direct, in economical gallon cans. Write now for circular and prices.

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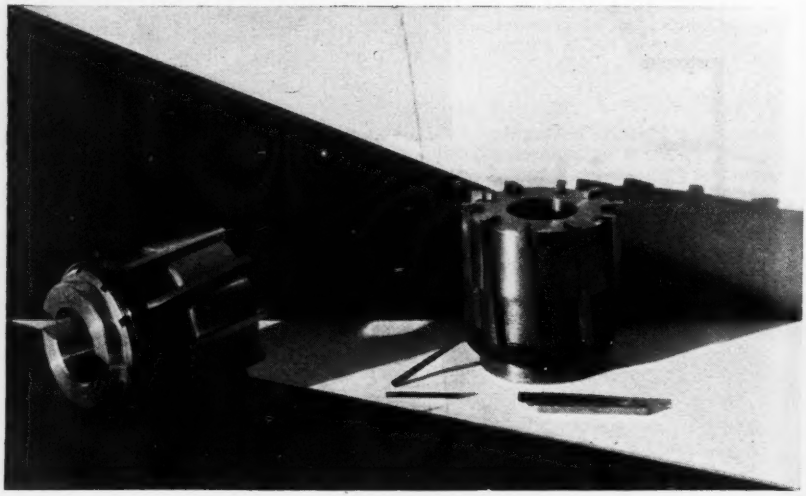
3-in-One Oil



Characteristic!

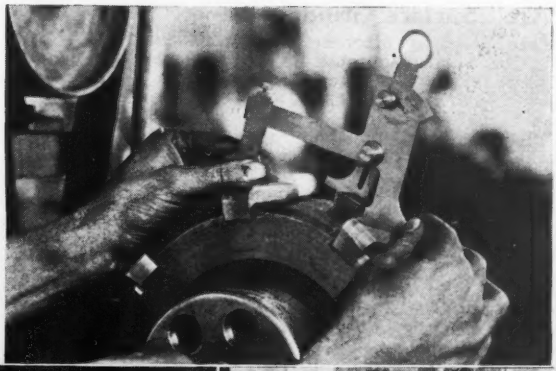
Barber-Colman Inserted-tooth Reamers have characteristic features of design that set them apart from all other reamers of the inserted-tooth type. The method of blade mounting is distinctively individual. It utilizes a full-length underlying wedge beneath each blade, and a locking pin which also has a bearing for its entire length against both blade and pin slot in the body. Consequently, Barber-Colman Inserted-tooth Reamer blades cannot tip or rock in any direction, even when subjected to unusually severe service.

These and other Barber-Colman Reamers of predetermined spacing and spiral angle are best sharpened on the Barber-Colman Reamer Sharpening Machine, with which they are in step. Specify these fine reamers on your next order. You will find them accurate, long-lived and economical.

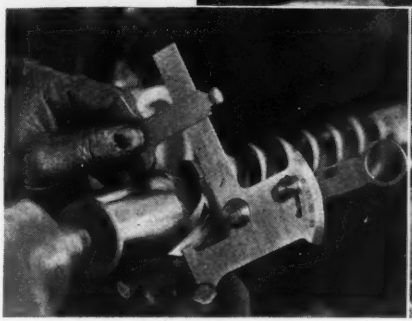
BARBER-COLMAN COMPANY

General Offices and Plant

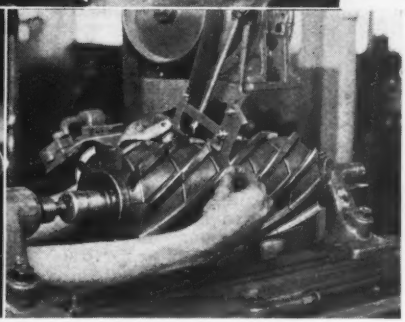
ROCKFORD, ILLINOIS, U. S. A.



Starrett Cutter Clearance Gage No. 459 checking clearance of coarse-pitch, inserted tooth alternate type channeling cutter.



No. 459 on a helical mill—direct, accurate reading.



No. 459 used to show clearance on inserted tooth sectional slabbing mill.

Give Your Cutters Correct Clearance

ON every cutter of 2" diameter and up, no matter what type it is—end, spiral, helix or inserted tooth — Starrett No. 459 checks the clearance directly and accurately in degrees.

The cutter need not be removed from its arbor on the grinding or milling machine. There's no uncertainty, no calculation — just three easy adjustments.

Let us send you our circular on Starrett Gage No. 459, and a copy of Starrett Catalog No. 25 MD. A card will bring them.

THE L. S. STARRETT CO.
World's Greatest Toolmakers
Manufacturers of Hacksaws Unexcelled
Steel Tapes, Standard for Accuracy
Athol, Mass., U. S. A.

Use Starrett Tools

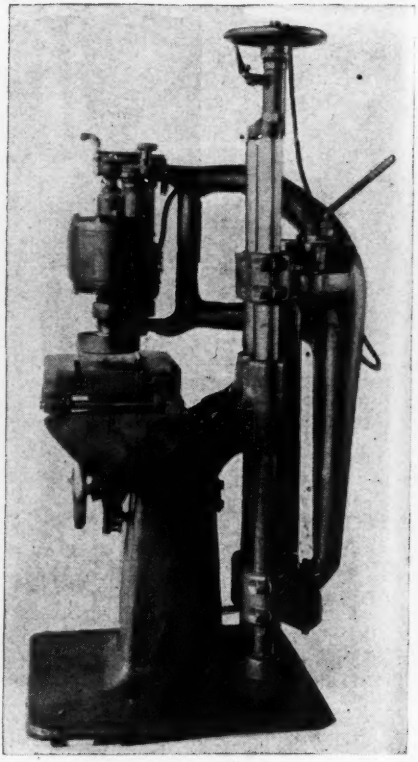
4844

"Ace" Surface Grinder

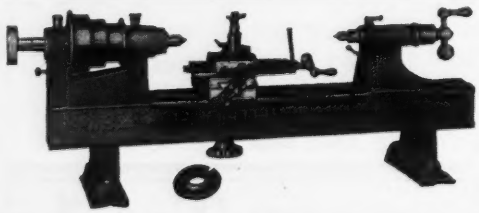
A surface grinding machine that is adaptable for a large number of uses, known as the "Ace" Surface Grinder, is now being marketed by L. V. Goebbels, 4419 Larchwood Avenue, Philadelphia, Penna. The machine is of rugged construction, and is intended for use on either heavy or light work, in tool or die shops, repair shops, or production shops.

The feature of this machine is that the work is stationary, while the wheel is passed over the surface to be ground. The grinding wheel is attached to the end of the shaft of the motor by which it is operated, and the entire wheel and motor assembly is attached to a swinging arm, as shown in the illustration. The swinging arm is manually operated, the only power required being that necessary to drive the wheel. The swinging arm is mounted on Timken precision bearings which have a carrying capacity of double the load that can possibly be placed upon them. Thus the operator is enabled at all times to feel the pressure of the wheel on the work, and he can feed accordingly. The swinging arm may be locked in any position and the short arm carrying the motor and wheel can be fed back and forth across the work by means of a worm and worm-wheel feed that is operated by hand.

An important feature of the machine is the handy means that is provided for setting up work quickly. The grinding table may be tilted in any direction, at any angle, and securely clamped in the desired position. This feature enables the operator to bring the surface of the work to the plane of travel of the grinding wheel, when surfacing irregular-shaped work. Graduations make it easy to duplicate set-ups. The machine is particularly suited to the maintenance of punches and dies, and the graduations aid in re-setting punches or dies for re-grinding to any specific shear. The size of the grinding table is 12 x 18 in., but much longer work can be ground if narrower than 12 inches. The swing-



"Ace" Surface Grinder



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Precision Bench Lathe
—is accurate for precision work. For turning, drilling, milling, threading and such a variety of uses, it is the ideal bench lathe for the factory and tool room.

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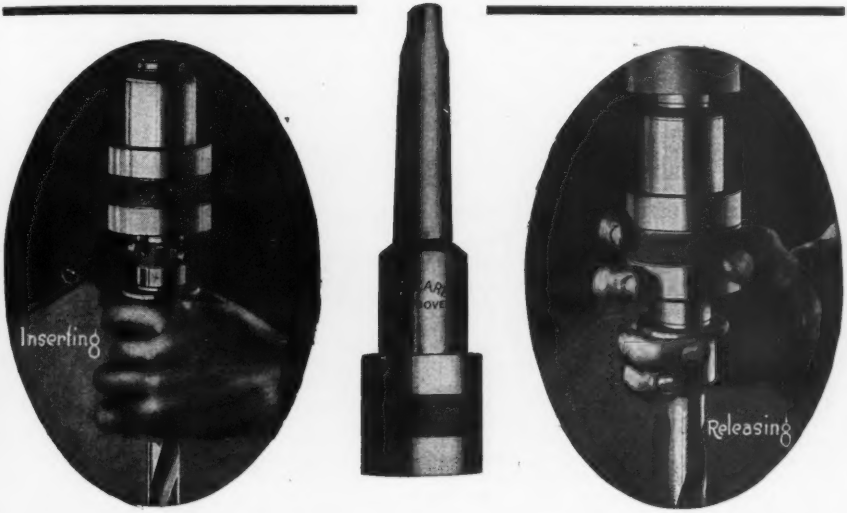


WIZARD Quick-Change Chucks and Collets make it easy for Drill Press operator to change tools

TO INSERT the tool while the spindle is turning he needs only to push the collet into the chuck. The positive automatic latch locks it instantly. Releasing is just as rapid and easy—a slight pressure of the thumb and forefinger allows the collet to drop out.

WIZARD Chucks hold tools centered and rigid. They match modern machines in quality and performance. They cut costs by saving time.

BULLETIN No. 12-B
Tells the whole Wizard story. Send for a copy!

McCrosky Tool Corporation

Meadville, Pa., U. S. A.

***Branches in* Cleveland, Detroit, Chicago, Toronto**
Agencies in all other principal cities

ing arm makes it possible to grind work that is too large or too high to be placed on the table of the machine.

The height of travel of the wheel over the table is 11 in. The size of the wheel with ¾ h. p. motor is 5 in.; with 1½ h. p. motor, 7 in. Speed of motor, 3,400 r.p.m. Net weight of the machine, approximately 1,000 pounds.

Ruthman Vertical Ball Bearing Motor-Driven Grinder Pump

The Ruthman Machinery Co., 532 East Front St., Cincinnati, Ohio, has brought out a vertical, ball bearing, motor-driven grinder pump of rigid and compact design, with a capacity of 120 gal. per min. for continuous operation. The motor, direct connected to the pump, is 2 h.p., 1725 r.p.m. The motor shaft is supported by two heavy duty No. 307 ball bearings and extends into the pump housing, where it forms the impeller shaft. The shaft is of more than ample size to insure rigidity and prevent vibration.

The pumping action is obtained through one revolving part, the impeller, which is so constructed as to prevent clogging. The abrasive material, chips, and grit are dispersed in the water or compound. To absolutely eliminate all possibility of injury to the impeller, an intake strainer is provided integral with the base casting. The openings of this strainer are large enough to allow free passage of the liquid and small enough to prevent large particles of any kind from entering the pump intake. The pump requires no packing, no felt washers, nor depending close fits of any part coming into contact with the grinding compound. Ample room is allowed between the impeller and housing to permit foreign matter to pass through without interference.

The upper end bell, or motor bearing flange, is totally enclosed, thereby preventing dirt, drippings, and so on, from entering the motor. The leads for wiring project through a conduit box mounted on the side of the motor frame,

Ruthman Vertical Ball Bearing Motor-Driven Grinder Pump

providing for safety. The pump can be furnished for either immersed or exterior installation, and can be provided in a variety of sizes ranging from ¼ h.p. to 5 h.p.

CUT YOUR STRAIGHTENING COSTS

Springfield Straightening Press

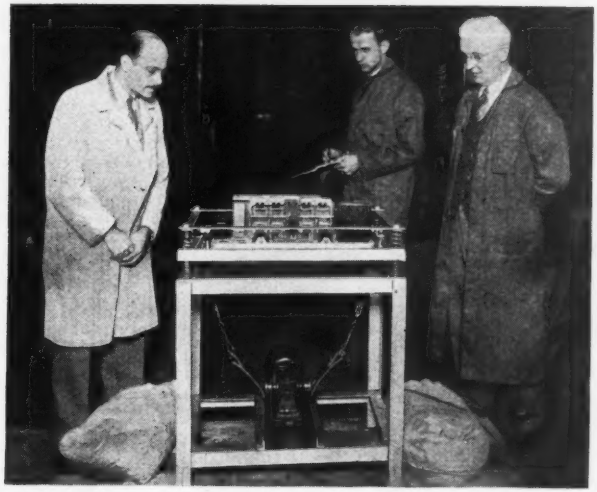
Made in three sizes.

THE Springfield Straightening Press is the ideal tool for straightening any length of rough or finished work—truing sprung tools—testing and balancing cams, or crank shafts—and scores of other jobs.

Place it on the bench—it saves your operators' time by eliminating waste steps, and allowing quicker handling of work.

Send for illustrated folder suggesting many uses.

The Springfield Machine Tool Co.
630 West Southern Avenue Springfield, Ohio
We also manufacture Engine Lathes and Shapers.



559,750 metal-twisting JOLTS

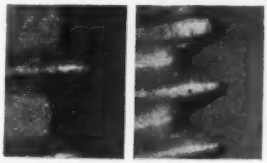
... but Self-tapping Screws DID NOT LOOSEN

From the Columbia University Testing Laboratories comes further proof that a manufacturer does not sacrifice assembly security when he takes advantage of the fastening economies afforded by Hardened Self-tapping Screws:—

By means of a special shake-test machine, a radio receiver taken right from the stock of the maker was subjected to exceptionally heavy vibration stresses. So severe was the vibration that many of the sheet metal parts of the set were twisted and broken. It was a stiff test for assemblies because vibration is the chief cause of fastening failure. The six assemblies made with machine screws could not stand such a jolting . . . they quickly fell apart. Yet not one of the 44 fastenings made with Self-tapping Screws loosened.

Other unbiased, scientific tests show that under tension and shear stresses, too, Self-tapping Screws hold better than the fastening devices they usually replace. The user of these unique Screws actually obtains stronger assemblies . . . in addition to fastening speed and economy, which results from eliminating tapping and other assembly difficulties. Send for our two free booklets. One tells all about the security tests. The other describes the way leaders in the metal working industries save money through the use of Hardened Self-tapping Screws.

These microphotographs tell the story



See tight engagement of Self-tapping Screw in metal

Note loose fit of machine screw in tapped hole

PARKER-KALON HARDENED SELF-TAPPING **Sheet Metal Screws**

PATENTED APR. 1, 1919 — No. 1300255 — MAR. 20, 1923 — No. 1451184 AUG. 16, 1923 — No. 1465146 — FEB. 10, 1925 — No. 1526152 — OTHERS PENDING

PARKER-KALON CORPORATION, Dept. E., 192-196 Varick Street, New York, N. Y.

Send me free booklets on the Security and Economy of assemblies made with Self-tapping Screws.

Name and Co.

Address

Quick As Wink
SHUT OFF VALVES
VALVE COUPLINGS

HERE IS A VALVE DESIGNED SPECIFICALLY FOR USE ON AIR LINES AND AIR OPERATED DEVICES

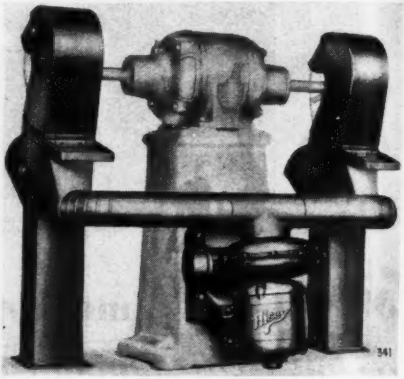
Quick-As-Wink

HI-SPEED POLISHING WHEELS WITH REPLACE ABRASIVE STRIPS CUT COSTS

C. B. HUNT & SON
SALEM, OHIO
U.S.A.

"Hisey" Exhauster Equipment

A motor-driven exhaust blower which can be mounted integral with the machine, as shown in the illustration, can now be furnished by The Hisey-Wolf Machine Company, Cincinnati, Ohio. This equipment can be supplied with "Hisey" buffing and polishing machines up to 5 h.p., the equipment to include dust collecting hoods as shown. It can also be supplied with "Hisey" floor



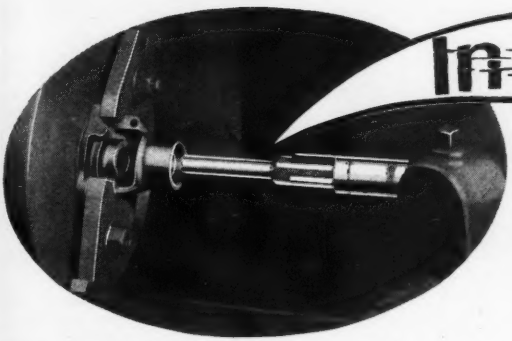
"Hisey" Exhauster Equipment

stand grinders of 10, 12, and 14-in. wheel capacity, to include combination exhaust guards.

A filter cabinet has also been developed which, although small and compact, effectively collects grit and dust and when mounted close up to the exhauster, requires but little space. This filter is said to be particularly adapted for individual installations. The filter can be supplied with any exhauster equipment.

Wright Type W Electric Hoist

The illustration shows the Wright Type W Electric Hoist, which is being built by the Wright Manufacturing Company, Bridgeport, Conn., for installations where high operating speeds, economical operation, and low-cost maintenance are first essentials. In order to combine high speeds with efficient operation, motors are used which were especially designed for this work and which are of liberal size. It is said that maintenance costs are reduced to the minimum by correct design, extremely simple construction, and the use



In Action

Combining Operations

Combining operations is the best means of cutting costs and increasing production.

And that's what the Eclipse Multi-Diameter cutter shown here "In Action" did for a well known manufacturer of automotive engines. This tool is used for simultaneously boring and facing a fan and water pump housing.

Thousands of these tools are used in all industries on all classes of work. They can be used to good advantage on your work too. Send us your blue prints and let us show you! Write for a catalog!

ECLIPSE COUNTERBORE COMPANY
DETROIT, MICHIGAN

POLDI CV Special Steel

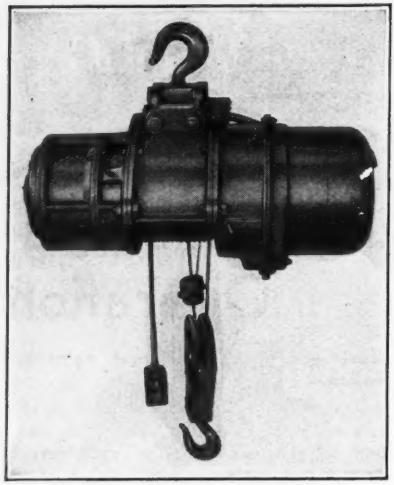
Makes Better Die Casting Dies

If you want your die casting dies to last longer . . . and wear better . . . make them out of POLDI CV Special Steel.

Here is a steel that is tough . . . and possesses excellent resistance to wear. It is entirely free from pores and resists temperature changes, eliminating danger of "hot cracks" while in service.

Past performances prove that die casting dies made of POLDI CV are capable of exceptionally large outputs . . . capable of maintaining a high production schedule. Let us tell you the whole story . . . write for bulletins today.

POLDI STEEL CORPORATION OF AMERICA
247 W. 18TH ST., NEW YORK 1627 W. AUSTIN AVE., CHICAGO
Representatives in Boston, Hartford, Stamford, Cleveland



Wright Type W Electric Hoist

of materials of the highest grades, such as alloy steel shafts, drop-forged, heat-treated gears and pinions, and Tru-Lay Preformed Cable.

The hoists are designed for different types of suspensions, and are furnished with either push button or pendant rope control. The motors and controls are fully enclosed, making them both dust-proof and weather-proof so that they are suited for both indoor and outdoor installations.

Francke Cross-Type Couplings

Smith & Serrell, 20 Washington Place, Newark, N. J., are now marketing the Francke Cross-Type Coupling shown in the illustration. This coupling is intended for use on all kinds of direct-connected and geared motor drives, and is designed to maintain its large, evenly-loaded and well-lubricated bearing areas unchanged under conditions of misalignment. The coupling provides a minimum of resistance to endwise float, and handles a limited amount of angularity.

The coupling consists of a steel casing, two forged steel flanges, and a cast iron cross which are assembled as shown in the illustration. The case is filled with

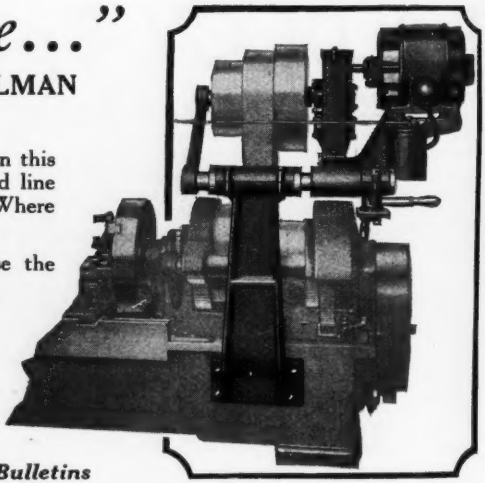
"Just Suppose..."

Said a user of the CULLMAN Lathe Drive...

"... that I ran these twelve lathes in this department with a single motor and line shaft, and the motor broke down. Where would I be?

"That's only one reason why I use the CULLMAN Lathe Drive on all my lathes."

Let us show you more reasons why you should use this driving unit. It is built in 1, 2, 3, and 5 h. p. sizes for lathes, shapers and milling machines.



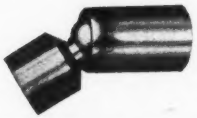
Write For Bulletins

SPROCKETS - SPEED REDUCERS - LATHE DRIVES

CULLMAN WHEEL CO., 1336 Altgeld St., Chicago, Ill.

APEX

Patented)



Strong Dependable

UNIVERSAL JOINTS

FIVE SIMPLE PARTS

SELF OILING

Used for repairing multiple drilling machines, airplane controls, truck dumping and road scraper controls. Joints made to your specifications.

Let us quote on your requirements. Write for our Joint circular.

THE APEX MACHINE CO. - Dayton, Ohio

The

PULLMORE

INDUSTRIAL CLUTCH

THE PULLMORE Industrial Clutch is employed as standard on many types of machinery, due to its extreme compactness and efficient operation. It is furnished in Single or Double types, and for operation in oil, or dry.

Let us supply you with additional details and make recommendations on any clutch application you may have.

ROCKFORD DRILLING MACHINE CO.

10 CATHERINE STREET

ROCKFORD ILLINOIS

SNYDER TOOLS

By this sign Economize

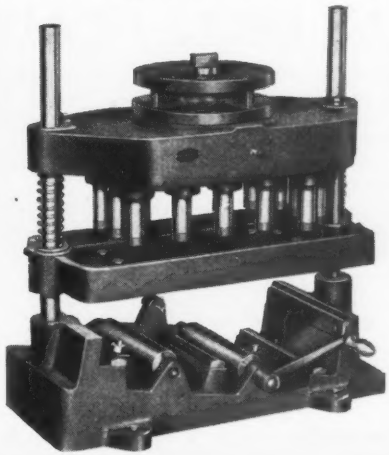
ECONOMIZE . . . does not mean buying price . . . low price. It means buying wisely . . . buying where you will get the most for your money!

And where can you get *more* for your money than in a SNYDER Tool set-up . . . modern tools that cut production and save investment. The illustration shows a tool set-up consisting of a SNYDER Ball Bearing Multiple drill head, bushing plate and work holding fixture.

SNYDER Possibilities are unlimited. Write for suggestions and prices.

Snyder Tool & Engineering Co.

3400 E. Lafayette Ave., Detroit, Mich.



4

Holes At One Time With a

U. S. DRILL HEAD

THE U. S. Drill Head changes your one-hole-at-a-time drilling machine into a multiple drill, by allowing any number of holes—fifty if necessary—to be drilled in the same time as one hole.

The particular head shown drills four holes at one time, but we make drill heads to drill any number of holes to meet your requirements.

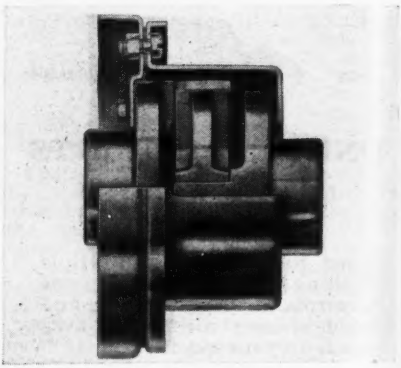
Send us blue print of your job, and we will show you what you can save by using a U. S. Drill Head.

The United States Drill Head Co.

1954 Riverside Drive

Cincinnati Ohio, U. S. A.

cup grease once or twice a year, which provides sufficient lubrication for all ordinary purposes. At load ratings the coupling can be run continuously with shafts misaligned up to $\frac{1}{16}$ in. out of



Cross-section view of Francke Cross Type Coupling.

center. A "limit stop" is provided which prevents operation too far out of line. The hole at the end of the grease case is concentric with the hub when shafts are in line. The coupling is available in four sizes, for use with shafts up to $2\frac{7}{8}$ in. diameter and to transmit up to 15 h. p.

Lyon Tool Storage Insert

Lyon Metal Products, Inc., Aurora, Ill., has announced a new line of tool storage inserts that can be used in any type of shelving of sufficient depth and width. Various units are especially designed to accommodate different types of tools, dies, and jigs in a manner that permits them to be always visible and easily accessible. In addition, these units can readily be adapted to any method of tool record keeping, including card, slip, or check system.

The No. 1 insert is designed for the storage of small tools. The insert is 6 in. deep at the top, tapering to 12 in. deep at the bottom. It provides bins for the storage of varying lengths of drills, reamers, and so on and will fit an opening 36 in. wide and 39 in. high. Shelves are equipped with $\frac{1}{2}$ in. label-holders welded to the front flange. Adjustable hooks for brass checks may be attached if desired. This insert has flat shelves with six dividers and provides

It's An Easy Job

. . . to keep precision grinding wheels smooth and true!

Just use a DESMOND DIAMOND DRESSER. The illustrations show a hand tool and diamond nibs for Landis and Norton Grinders.

Norton Nib

Landis Nib

And, if necessary, we will mount your diamonds in any special holder that may be required. Catalog M mailed on request. *The Desmond-Stephan Mfg. Co., Urbana, Ohio.*

Desmond Diamond Dressers

Machine Steel Discs

From Stock or Cut to Order

This is a New Service

for your machine shop and tool room.

We can ship promptly any size machine steel disc from 1" to 12" in diameter, any thickness and in any quantity for your production needs.

Send us your requirements and we will quote

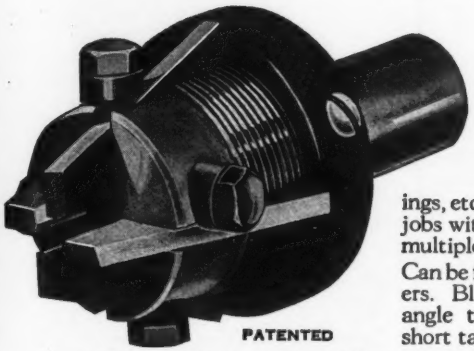
Write, wire or phone us today

PASSMAN BROS.

705 Washington Blvd. Chicago, Ill.

Genesee Adjustable Hollow Mill

Made in 7 different styles



PATENTED

Has adjustable, replaceable blades and can be replaced at nominal cost, making it unnecessary to continually buy new tools.

The ideal tool for finishing your forgings, castings, etc. Do your several operation jobs with Genesee inserted blades multiple operation tools.

Can be fitted with drills and reamers. Blades can be ground any angle to point work and turn short tapers.

A Genesee Adjustable Hollow Mill can be made for every job

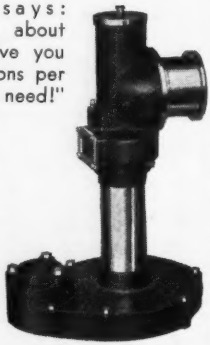
WRITE FOR CATALOGUE

GENESEE MANUFACTURING CO., Inc.

ROCHESTER, NEW YORK

VOLUME!

High - speed production and precision make a **volume** of coolant essential. But "GUSHER" says: "Don't worry about coolant, I'll give you as many gallons per minute as you need!"



MODEL BLR
is especially adaptable to large machines demanding a greater volume and pressure. Delivers 106 gallons per minute at a 4 ft. head.

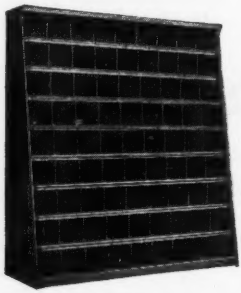
GUSHER COOLANT PUMP

MODEL ULO
An outside installation model which is equipped with a ¾" intake and discharge, a ¼ H. P. motor with a 5 gallon maximum pressure.

Send For Complete Catalog.

THE RUTHMAN MACHINERY CO.
532 EAST FRONT STREET,
CINCINNATI, OHIO

81 openings approximately 3¾ in. wide by 3¼ in. high. The insert itself is 34½ in. wide, 12 in. deep and 37⅝ in. high.



No. 1 Insert; For Storage of Small Tools

In the No. 2 insert, shelves slope upwards toward the back at a proper angle to keep small drills, reamers, and taps readily accessible. The insert is 6 in. deep at the top, tapering to 17 in. deep at the bottom. The insert is 34½ in. wide, 17 in. deep and 37⅝ in. high. Adjustable check hooks can be included if desired.

The No. 3 insert is for the storage of small tools or small dies, bolts, screws,

No. 2 Insert; For Use In Dispensing Small Tools in Tool Cribs

nuts and miscellaneous supplies for toolmakers. It contains forty-two compartments, each equipped with a 1½ in. bin front at the front. The insert is 34½ in. wide, 9 in. deep and 37½ in. high.

Sloping shelf insert No. 5. Sloping shelves on this insert are adjustable on 1 in. centers and are designed for visible and accessible storage of drills, reamers, taps, and so on. The shelf-dividers are also adjustable on 1 in. centers and the bin fronts are punched every inch for the in-

Ask any user of

The RHODES "Convertible"

. . . he'll tell you how it can be used either as a slotter or as a shaper and how accurate, speedy, and economical it is.

He'll tell you that it provides an ideal means of doing a host of jobs usually assigned to much larger machines and how easily it can be changed from one tool to the other, saving space in any shop.

Send for a bulletin.

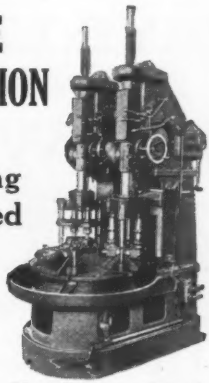
THE RHODES MFG. CO.
WALTHAM, MASS.

INCREASE PRODUCTION

with

Self-Oiling All-Geared Units

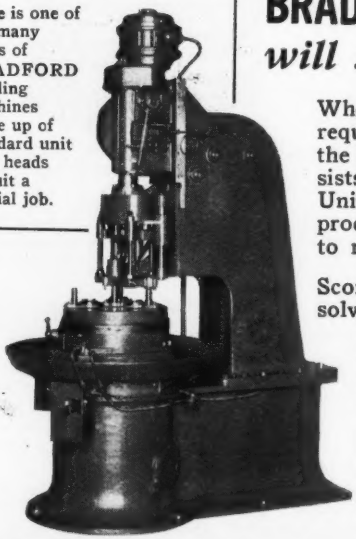
Write for Catalog U



No. 242 Gang—One of a large number of special applications for mass production.

BARNES DRILL CO.
801-851 CHESTNUT ST.
ROCKFORD, ILLINOIS, U. S. A.

Here is one of the many types of BRADFORD Drilling machines made up of standard unit type heads to suit a special job.



BRADFORD Drilling Machines
will solve your problems!

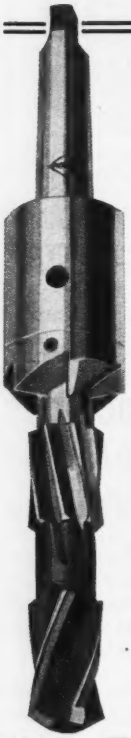
When you have a special drilling job which requires a special machine . . . investigate the BRADFORD Drilling Machine. It consists of one or more BRADFORD Standard Unit Type heads assembled into one high production unit and mounted at any angle to meet your special requirements.

Scores of manufacturers have not only solved drilling problems . . . but also hollow milling, countersinking and tapping problems with these machines. They obtain a better job . . . in less time . . . and at lower costs.

Let us show you what such a BRADFORD Machine will accomplish in your shop. Send us blueprints or samples of your work TODAY.

BRADFORD MACHINE TOOL CO. 659 EVANS STREET CINCINNATI, OHIO

SAVE LABOR
WITH
MIDWEST
TOOLS



THE most expensive item in production is labor—save labor and you cut costs! The MIDWEST tools save labor by combining operations.

The tool illustrated combines four operations in one....it drills, reams, spot faces and chamfers.

The Midwest Pin Drive is also an outstanding feature of the Midwest tools. This drive is a solid and accurate drive which eliminates all chance of breakage, gives extra long service and enables you to work to closer limits.

Here is a method which will cut your costs....get the details....write for a catalog!

Midwest Tool & Mfg. Co.

Division of the McCrosky Tool Corporation

2362 West Jefferson Ave.

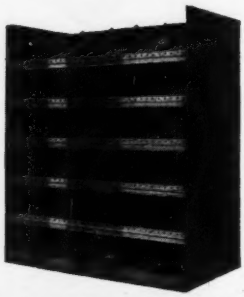
DETROIT, MICH.

sertion of hooks for brass checks. Each shelf is equipped with a label-holder.

No. 3 Insert; For Storage of Small Parts

The insert is 34½ in. wide, 17½ in. deep, 37⅝ in. high.

Three box inserts are available, differing only in the number and size of boxes with which they are fitted. Each



No. 5 Insert; Equipped With Sloping Shelves and Shelf Dividers, Also Check-Hooks

box is designed to permit the adjustment of dividers on 1 in. centers so that a number of compartments can be utilized in each box. The box insert is

No. 12 Box Insert, 18 In. Deep

34½ in. wide, 17 in. deep and 10⅝ in. high. These inserts are available in the 12-box size, 18-box size and 24-box size. They are very desirable for the compact storage of small tools and supplies.

WHITON LATHE CHUCKS

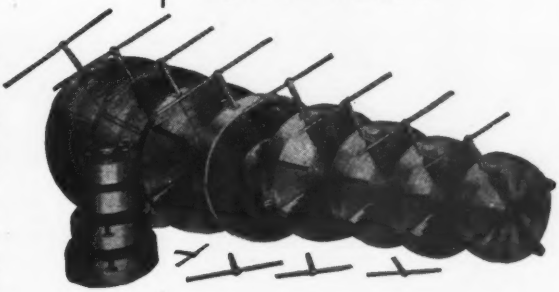
For a Sure Grip!

WHEN work must be held rigidly and securely for accurate machining at top speeds — WHITON Lathe Chucks prove their superiority!

WHITON Chucks—and there's one for every requirement—are good chucks. Their design and workmanship assure you dependable service over a long period of time.

Get a WHITON Catalog—it shows the complete line of WHITON Chucks as well as many special chucks built for special requirements.

Here is a group of WHITON Steel Body Independent Chucks designed to hold heavy work under heavy cuts at high speed. The one-piece body resists sudden strain.



THE D. E. WHITON MACHINE CO.

NEW LONDON CONN.

Speed Reducer, Coupling and Motor In One Unit!

MAXIMUM SPEED REDUCTION EFFICIENCY!

HERE is a speed reducer that is *motorized*. Motor and speed reducer are engineered as one compact unit. Makes construction simple, more solid and sturdy, and insures perfect alignment of gears and shafts *permanently*. Simplifies your speed reduction problem.

Janette *Motorized* Speed Reducers are made in Single and Double Reduction Worm Gear types and Single Reduction Spur Gear type. Motors 1/30 to ¾ H. P.—AC or DC. Standard ratios from 2:1 to 60:1.

JANETTE MANUFACTURING CO.

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558 WEST MONROE ST., CHICAGO, ILL.

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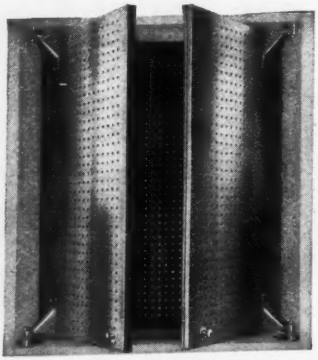
Milling Cutter Insert No. 4 is very practical for the storage of milling cutters and gages on pegs. The pegs may be adjusted on 1 in. centers. The entire



No. 4 Insert; Contains Pegs For Storage of Milling Cutters or Gages

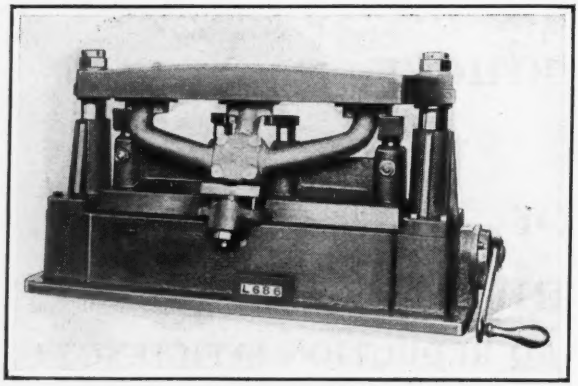
insert consists of one stationary panel 36 in. wide and 38 in. high at the back of the shelving rack, with two swinging panels 18 in. wide and 38 in. high at the front. Swinging panels can be used on both sides; that is, pegs can be inserted and milling cutters hung on both faces. Especially designed hooks are available for the accommodation of brass checks.

Victor Valve Seat Tap

The Landis Machine Co., Inc., Waynesboro, Penna., has developed and placed on the market a tap of unique design, called the Victor, for tapping the valve seat ring threads in gate valves. These threads present an unusual tapping problem in that the major diameters of the threads are greater than the diameters of the port openings.

The Victor Valve Seat Tap is fitted with double-end chasers, one end for each of the two valve seat ring threads. The construction of the tap is such that the chasers, when collapsed, will clear the port openings. The chasers are expanded to the cutting position by means of a handle provided for that purpose after the lap has entered the valve body through one of the port openings.

The two threads are tapped with the same chasers in one chucking. The tap is suitable for valves with either parallel or angle seats. Valves with



Speedy operation —correct locating —secure clamping are all obtained in one single lever movement.

Swartz Fixtures

are designed and built to give correct operating results and years of honest service.

An intake manifold of a popular V type motor is shown which is loaded and clamped in three seconds. There are things that will interest you in our new catalogue 131-B. Write for your copy today.

Send in your prints for drilling and milling operation and learn how conveniently they may be handled.

SWARTZ TOOL PRODUCTS COMPANY
DETROIT, MICHIGAN

TWENTIETH CENTURY BALANCING TOOL

Always on the level

The most practical, sensitive and inexpensive device manufactured for balancing pulleys, cones, armatures, fly wheels, polishing wheels, etc. Will set anywhere and is easily portable. In sizes up to 24,000 pounds capacity.

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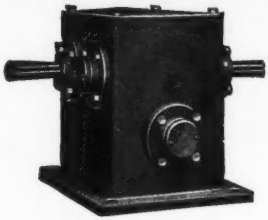
Sundstrand Machine Tool Co.
ROCKFORD, ILL.

2500-1

is a standard ratio of reduction in

WHS

SPEED REDUCER, No. 4D



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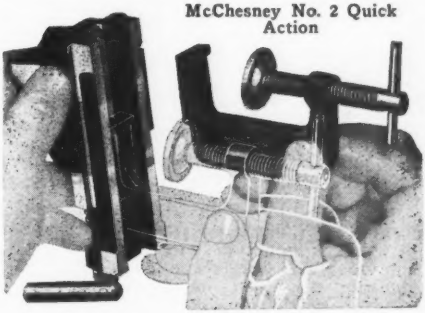
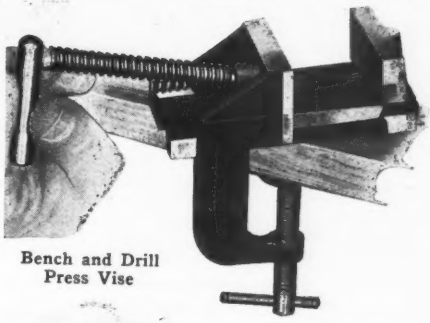
Winfield H. Smith, Inc.
30 EATON STREET
SPRINGVILLE, ERIE CO., NEW YORK

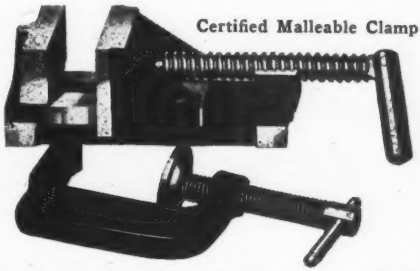
McChesney No. 2 Quick Action





Bench and Drill Press Vise

Certified Malleable Clamp



Width of jaw, 2"; depth, 13/16"; jaw opens 1⅞"; Weight, 1¾ lbs. Designed for use on flat surfaces such as magnetic chucks, drill press tables, etc., or it may be securely fastened to a work bench or other convenient object at any desired angle with the jaws either facing or away from the workman, by attaching the Interlocking Clamp as illustrated.

Send [CHECK MONEY STAMPS] **$2.00** *Mailed Parcel Post*

WASH CO. 33 S. Clark St. CHICAGO

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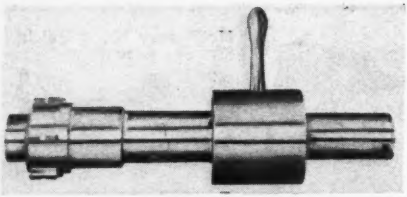


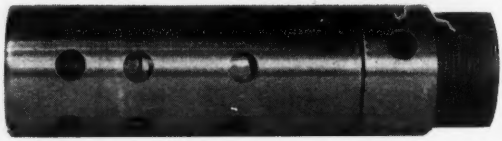
Victor Valve Seat Tap

angle seats, however, require a fixture of the trunnion type with stops to bring the valve seat ring openings in line with the tap.

"Ideal" Feed Finger

Smoother operation of automatic screw machines is said to result from the use of the "Ideal" Feed Finger which has been placed on the market by the Ideal Feed Finger Company, 7310 Woodward Avenue, Detroit, Michigan. The finger consists of an adapter, a housing—one end of which screws into the adapter, the pads which grip the stock, a closer which applies tension to the pads, and a heavy spring which keeps the closer in contact with the pads. In use, the shell and adapter of the feed finger become a part of the machine, it being only necessary to insert a set of pads for replacement or when changing the size of the material in process of machining.

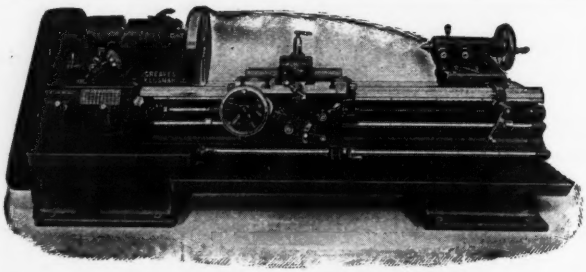
The manufacturer states that the parallel grip under even tension provides for unusually long life of the feed finger. The pads can be made of material to suit the requirements, thereby eliminating the scratching or marring of the material being machined. The low cost of the pads provides for low cost of operation. The uniformity of feed which is a feature of this feed finger greatly reduces the breakage of drills and other tools.



"Ideal" Feed Finger for Automatic Screw Machine

"Ideal" Feed Fingers are carried in

Boost Production with



G. K. SINGLE LEVER CONTROL

Built in six sizes . . . belt or motor driven.

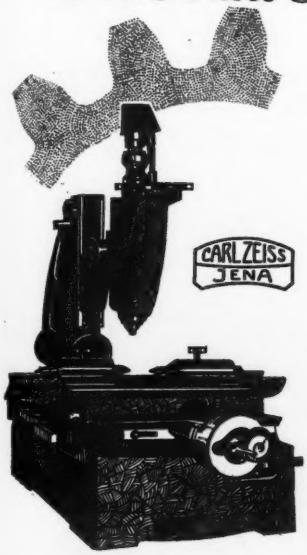
G. K. Single Lever Control lathes will boost your production because they are easy to operate. Any speed of an extremely wide range can be instantly selected through only ONE lever.

Easy Operation means faster work . . . a speeding up of lathe operation . . . boosting production.

Send for a G. K. Catalog. It describes many more G. K. Exclusive features.

THE GREAVES-KLUSMAN TOOL CO., Cincinnati, O.

WATCH *the* SHADOW *of Your Work*



Use the CARL ZEISS Toolmakers' Microscope

. . . for accurate and rapid inspection of all classes of tools and work. A magnified, undistorted contour of the object is viewed directly through the ocular, or is sharply silhouetted against a screen.

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Sole Distributors:

GEORGE SCHERR CO.

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"6 HOURS *for a three-day job"*

That's what the head toolmaker of the Seneca Camera Mfg. Co. says about the OLIVER Die Making Machine. On all sawing, filing and lapping operations the OLIVER will quickly save its modest cost. YOU SHOULD OWN ONE. Made in nine styles for materials up to 3" thick.

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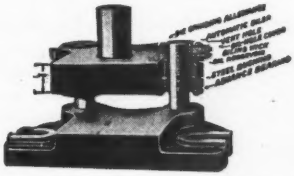
OLIVER OF ADRIAN

The OLIVER INSTRUMENT Co.
1430 Maumee Street, Adrian, Michigan

BAUMBACH

Automatically Oiled

DIE SETS



Standardized die sets, embodying many exclusive features, and a listing of 70,000 stock sizes afford a service that is unsurpassed.

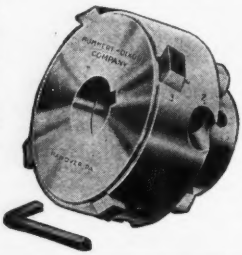
Your Inquiries Solicited
Send for New 120 Page Catalog

E. A. Baumbach Mfg. Co.
1806 S. Kilbourne Ave. Chicago, Ill.

Accurate Tool Setting Quickly Made

In MUMMERT-DIXON BORING HEADS "tap and try" adjustments are eliminated. Its simple, yet practical method of adjusting the tool bits assures you greater precision.

This Boring Head is made in seven sizes to bore from 3" to 13". Uses standard size tool bits. Its initial cost is low and is built sturdy and strong to last. Better see one.



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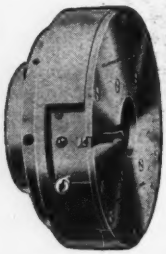
Saves Many Costly Set-Ups!

The MUMMERT-DIXON FACING HEAD is a *real wonder!* It saves many costly set-ups because work can be done easily and rapidly, which heretofore, by ordinary methods, was costly and slow.

It is the ideal facing tool for use on lathes, milling machines, drill presses, boring mills, etc. The tool *automatically* feeds from the center outward, or from the outside toward the center. It is built in eight sizes, 6" to 40".



Write for Bulletin!

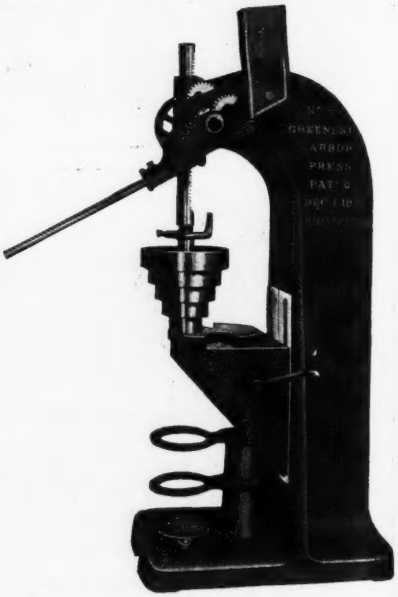
Mummert-Dixon Co.
120 Philadelphia Street
HANOVER PENNSYLVANIA

stock for all standard sizes of automatic screw machines up to and including ⅞ in. Other sizes can be obtained on special order.

Greenerd Arbor Press Now Timken-Equipped

Edwin E. Bartlett Company, Nashua, N. H., announces a number of additions and improvements to its line of "Greenerd" arbor presses. This line now includes 64 different styles of presses, both hand and power driven, of horizontal as well as vertical type. With these machines any kind of pressing and forcing work can be handled, including assembling, straightening, pressing arbors in and out of work, broaching, and so on, up to 40 tons pressure.

The press shown in the illustration is one of several of the manually and power operated presses that are now



Greenerd Arbor Press Equipped With Timken Roller Bearings

equipped with Timken Tapered Roller Bearings. The use of Timken bearings in these machines has reduced friction considerably, making it possible to obtain a much greater pressure with less exertion than was possible before roller

KELLER
BURS and ROTARY FILES

KME

Get Your Copy

This new bur circular is just off the press, giving the most complete information and data on the use of burs and rotary files ever compiled.

Keller burs and rotary files are made in hundreds of different shapes, sizes and cuts. Burs are the most efficient method for cleaning bronze and aluminum castings. Also for finishing dies and metal patterns.

These burs will work satisfactorily on steel, bronze, aluminum, copper, rubber, horn, wood, etc. They are adaptable for use on any flexible shaft machine, portable drills or stationary machines.

Let Us Send You a Copy Today

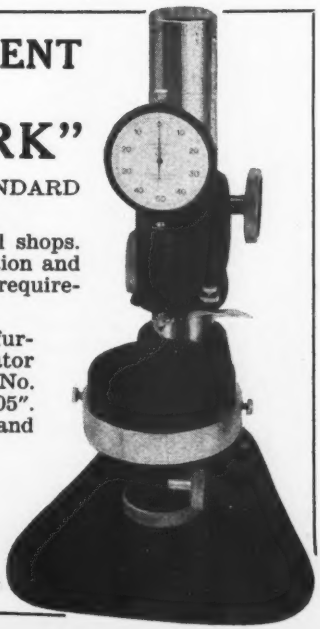
Keller Mechanical Engineering Corp.
84 FRONT ST. BROOKLYN, N. Y.
Complete Stock at Chicago and Brooklyn

"A PRECISION INSTRUMENT *Built For* PRODUCTION WORK"

. . . is one user's description of the "STANDARD GAGE" Comparator Model 105.

"It is the ideal comparator," he says, "for all shops. It is distinctive in design, rugged in construction and incorporates the finest accuracy to meet all requirements."

The "STANDARD GAGE" Comparator is furnished with either No. 2-X Special Indicator which gives readings in .0001" or with the No. X-2-X indicator which gives readings in .00005". It is especially recommended for production and final inspection, as well as precision tools.



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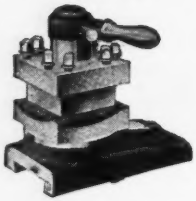

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12 Sizes

For any make or size of Lathe, old or new.

STYLE "G"
Square head, for carrying four ordinary lathe tools.

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bearings were adopted. The roller bearings also contribute to the smoothness of operation.

"Queen" Triangular Machinists' Level

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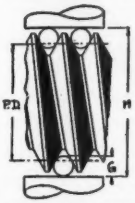

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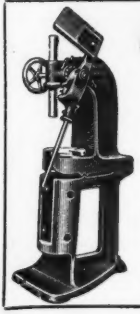

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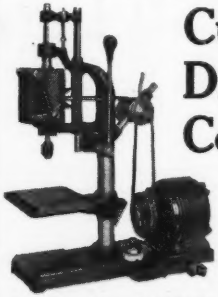

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Put the New VICTOR SUPER-DRILL to work in your shop. Its five spindle speeds makes it applicable to practically every drilling job.

And, the New WONDER PULLEY . . . an integral part of this machine . . . enables you to select and shift speeds *without stopping the drill.* The savings from this feature alone pays for the drill in a short time.

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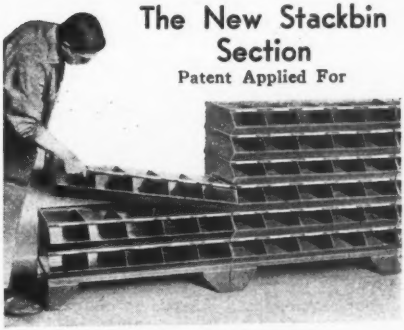

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Ideal for temporary stockrooms near the job. Base separate. Counter top can be supplied.

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Bin #2-S	37"	15"	5¼"	5	7½"
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Sections with different width bins can be furnished if desired.

Stackbin Corporation

Pearl and Rice Streets Providence, R. I.

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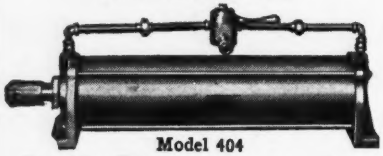

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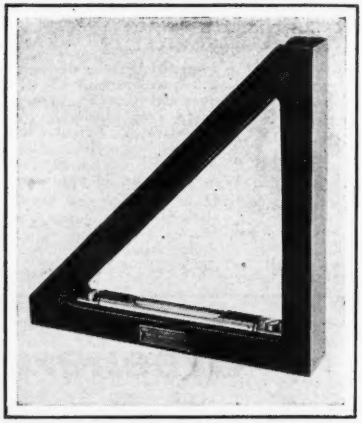

"Queen" Triangular Machinists' Level

tion basis. A case is furnished to protect the instrument when not in service.

Wyr-Omat-Ick Compensator

The subjects of bearing compensation in general and of Wyr-Omat-Ick Com-

(*Continued on page* 105)

Stamped Blanks *in* Small Lots

SPECIFICATIONS:
Material—¼" C. R. Steel
Limits—±.002"
Finish—Exact Duplication
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THE cost of producing the first hundred stampings as shown cost a customer in this case only $15.00 and $2.10 for the blanking of each additional hundred blanks *at any time thereafter.* Special stamped blanks of any size and shape can be produced for you to order at proportionate prices.

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They are made in the following sizes:

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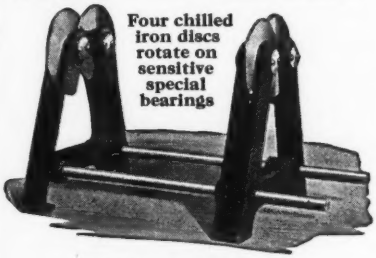

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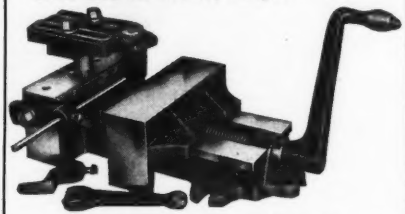
With and Without Jig Attachments
3 sizes, 6", 9" and 12" jaws
Often used on Miller, Shaper or Planer



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The attachments mean you can do much duplicate drilling without the cost of a jig. Any vise will pay. More time is consumed in catching work than drilling it.

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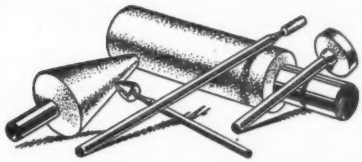

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For all small-hole grinding; and for all hard-to-get-at places.

Always ready.
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Cut anything.
Securely mounted.
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Ames Gages: Catalog No. 50, issued by the B. C. Ames Company, Waltham, Mass., contains complete descriptions and illustrations of the dial gages, gage heads, upright gages, cylinder gages, dial micrometers, and precision verifiers, special gages and attachments made by this company. Copy free upon request.

Steel Furniture for the Shop: The complete line of steel furniture made by the Angle Steel Stool Co., Plainwell, Michigan, including steel stools and chairs, steel foremen's desks, lockers, tables, tool stands, machine tenders, shop boxes and pans, iron bar racks, trucks, bench legs, and bench drawers, is described and illustrated in Catalog "C," which is issued free to machine shop executives.

Stop Tap Breakage: A booklet that tells how to stop the breakage of taps, reamers, and other tools, by the use of a friction chuck, also how to use the chuck for setting studs or nuts, has been issued by The Apex Machine Co., 200 Davis Ave., Dayton, Ohio. Sent free upon request.

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Modern Drilling Equipment: Circulars describing the various types and sizes of Barnes upright drills, multiple drills and horizontal drilling machines made by this company have been issued by the W. F. & John Barnes Co., Rockford, Ill.

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Disc-Inspected Tool Steels: A bulletin discussing the advantages of disc-inspected tool steels can be had by writing to The Carpenter Steel Co., Reading, Penna.

Mounted Grinding Wheels for use in small holes such as are found in bushings, dies, gears, tools, etc., are described in a catalog that has been issued by the Chicago Wheel & Manfg. Co., 110 S. Aberdeen St., Chicago, Ill. Copy free upon request.

Electric Tools: The complete line of "The Cincinnati" Electric Drills, Grinders, Buffers, etc., manufactured by the Cincinnati Electrical Tool Company, Cincinnati, Ohio, is fully described and illustrated in their new catalog. Free upon request.

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Swiss Files: The complete line of Grobet Swiss Files for use in die and tool work or for other fine work is described and illustrated in Catalog "K," published by the Grobet File Corporation of America, 3 Park Place, New York, N. Y. Copy free upon request.

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Texdrive Grinders for Vitrified or High Speed Wheels: A six-page bulletin No. 43 describes in detail and illustrates the advantages of the new Hisey Texdrive Grinder —stressing especially the multi-speed and single-speed machines. Write for a copy to The Hisey-Wolf Machine Co., Colerain and Marshall Sts., Cincinnati, O.

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Slow Speed Drive Assembly: A motor, coupling, and speed reducer combined in one unit can now be obtained from the Janette Manufacturing Co., 558 West Monroe Street, Chicago, Ill. Ask for Bulletin SR-131.

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Keller Automatic Toolroom Machine for machining dies, metal patterns, jigs, core boxes, molds, and other irregular parts is fully described in a booklet that can be had free by addressing the Keller Mechanical Engineering Corp., 84 Front Street, Brooklyn, N. Y.

Koebel-Wagner Diamonds for Wheel Dressing: The Koebel-Wagner method of mounting diamonds and the use of the "Dykon" gage are discussed in a bulletin issued by the Koebel-Wagner Corporation, 144 Orange St., Newark, N. J. Free upon request.

Threading Machinery: Catalog No. 32, containing full descriptions of Landis threading machines, stay bolt threading machines, bolt factory threading machines, automatic forming and threading machines and chaser grinders can be had without charge by addressing Landis Machine Co., Inc., Waynesboro, Penna.

Cutter and Tool Grinding: A book that tells how to grind tools and cutters accurately and which also describes and illustrates the different types of LeBlond Universal Tool Room Grinders will be sent free upon request. Address, The R. K. LeBlond Machine Tool Co., Cincinnati, Ohio.

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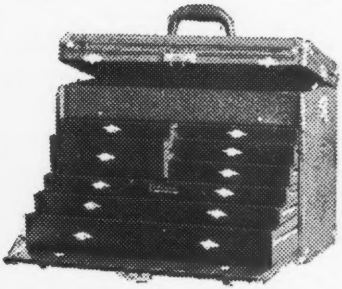

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All Size Holes

Pulley Diam. inches	Size of Holes inches
2½	⅜ ½ ⅝
3	½ ⅝ ⅞
4L	⅝ 1
4	½ ⅝ ¾ 1
5	½ ⅝ ¾ 1
6	½ ⅝ ¾ 1
8	½ ⅝ ¾ 1
10	½ ⅝ ¾ 1
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Machine Steel Discs are now available in any size from 1 in. to 12 in. diameter, of any thickness and in any quantity. Write for information to Passman Brothers, 705 Washington Blvd., Chicago, Ill.

"Most Frequent Mistakes Made in Hardening:" Users of steel can obtain a wall-chart on which are listed the most common mistakes made in hardening tool steels, results of mistakes as shown on the tools, appearance of fracture, and suggestions for remedying the mistakes, by writing to the Poldi Steel Corporation of America, 247 West 18th Street, New York, N. Y.

Tapping Devices, Quick-Change Chucks, Stud-Setting Tools and Bench Tappers: A catalog describing the various types and kinds of tapping, drilling, and stud-setting devices manufactured by the Procunier Safety Chuck Company, 12 South Clinton Street, Chicago, Ill., can be obtained without charge by addressing this company. The catalog also tells the part that Procunier tools play in obtaining greater accuracy and less tap breakage.

Shape or Slot With This Machine: The Rhodes Convertible Shaper, made by The Rhodes Manfg. Co., Waltham, Mass., can be used for horizontal shaping or vertical slotting. Details upon request.

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Pulmore Industrial Clutch: A multiple disc clutch, made in two types, to run in oil or dry, and which is so built that it can be operated at high speeds, is illustrated and described in a folder that will be sent free by the Rockford Drilling Machine Company, Rockford, Ill.

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Simonds Files: A useful book on files showing the various styles made, their uses, cross-section, and cuts, and containing a number of reference tables and other information useful in a machine shop can be had by addressing Advertising Dept., Simonds Saw & Steel Co., 470 Main Street, Fitchburg, Mass.

The Most Efficient Speed for the operation of special production units, power conveyors, and other machinery by the use of the WHS Speed Reducer and how it can be obtained is told in a bulletin that will be mailed free by Winfield H. Smith, Inc., 30 Eaton St., Springville, N. Y.

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Machinists' Tools and Gages: Catalog No. 24, issued by the L. S. Starrett Co., Athol, Mass., describes and illustrates the complete assortment of machinists' fine tools and gages made by this firm. Copy free upon request.

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Electrically-Driven Portable Tools: The "U. S." line of electric drills, die grinders, electric screw drivers, surface grinders, tool post grinders, and bench and floor grinders is described in Catalog No. 29, which has been published by The United States Electrical Tool Co., 2471 W. Sixth St., Cincinnati, Ohio.

How To Measure Threads with Wires: Circular W26, issued by The Van Keuren Co., Watertown, Mass., tells how to obtain the correct thread pitch diameter with a micrometer and wires. Copy free upon request.

Tool Chests for Machinists and Toolmakers: The complete line of fine tool chests for machinists and toolmakers made by J. M. Waterston, 420 Woodward Ave., Detroit, Mich., is described in Catalog No. 25. Ask for it.

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Whiton Steel Body Lathe Chucks: The various types and sizes of steel body chucks for lathes that are made by the D. E. Whiton Machine Co., New London, Conn., are described and illustrated in a booklet that will be sent free upon application to this firm.

Wrenches For Every Use: "Guaranteed Against Breakage" tappet wrenches, pipe and fitting tongs, offset wrenches, and wrenches for all other uses are described and illustrated in a series of folders which can be obtained without charge by addressing J. H. Williams & Co., Buffalo, N. Y.

(*Continued from page 98*)

pensators in particular are discussed in a booklet that is now being put out by the Wyrick Engineering Company, Wyandotte, Michigan. The book contains full instructions as to the use, installation, and adjustment of the compensators made by this firm, as well as a discussion of the advantages to be obtained through using them. A number of illustrations add to the interest of the discussion. Copy free upon request.

J. & H. Magnetic Chuck Circular No. 206

The J. & H. Electric Company, 202 Richmond St., Providence, R. I., has issued a bulletin—No. 206—in which the various types of flat, rotary, swivel, and vertical chucks made by this firm are described and illustrated. Descriptions of the J. & H. Demagnetizing Switch, Auxiliary Plates, and Demagnetizers are also included. Copy free upon request.

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"I'm saving young men,"
Said Reverend Lee.
"Oh fine," said Lizzie,
"Please save one for me."

The man who takes advice is usually smarter than the man who gives it.

'Twould seem that ev'ry time the bank takes on a new depositor they appoint four more directors.

Well Named

The furnace man's daughter
Is easy to make,
But the boys call her "Grate"
'Cause she's hard to shake.

Don't take your undertaker too seriously when he asks you to drop over some time.

Money is like leisure—enjoyed to the fullest only when it follows work well done.

Sometimes a woman's ideal is shattered—many times he's broke.

Goin' Back Some

Willie says, "I been spanked,
I'm burnt to an ember,
I been spanked as far back,
As I can remember."

All salesmen are Scotch when they're payin' their own expenses.

When friend wife laughs at one o' your jokes, you know you've either got a dern good joke or a hullava good wife.

People listen to their conscience, but they don't believe all they hear.

Poor Tony

Tony broke a tooth,
Poor little wop,
Did it shiftin gears
On a lolly-pop.

There's safety in numbers—a banana is never skun till it leaves the bunch.

What a blow it must be for college grad to find that his sheepskin is 'bout as helpful to him in locatin' a job as his raccoon coat, his busted down fliv smothered with wise cracks an' his red suspenders.

"To make Anti-freeze,"
Said Lizzie Channels,
"All yuh gotta do
Is hide her flannels."

The latest is that the Gas Co. favors the meter readers carryin' sumpin on the hip—it helps 'em to see double.

For the married bozo, life is like a game o' checkers—He gets jumped ev'ry time he makes a bad move.

Here's a tough job —well handled....

● *An eighth of an inch of metal is removed at a speed of 24 inches per minute . . . and the cutters have to make a difficult detour!*

● *A Cincinnati Duplex Hydromatic, with "O.K." inserted tooth milling cutters, is being used.*

● *You don't have to fuss with "O.K." inserted blade tools . . . just press out the blades—move over one serration—re-grind—ready to go! It is the original serrated tooth system . . . locates itself, locks itself and stays put.*

● *We have a new booklet on the use of modern tools. Write for a copy of "CUTTING COSTS WITH CUTTING TOOLS". . . no obligation whatever.*

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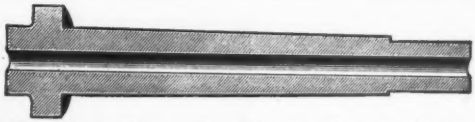

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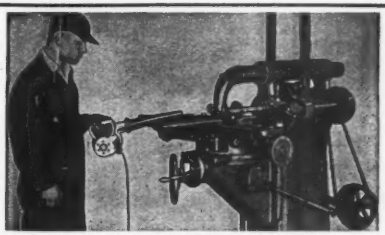

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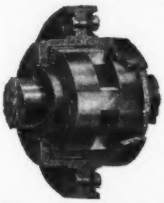

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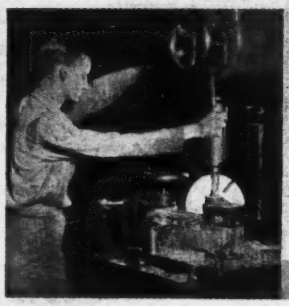

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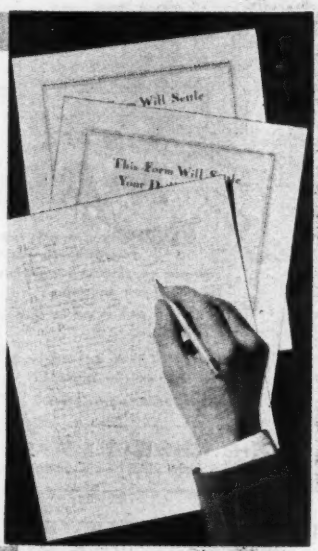

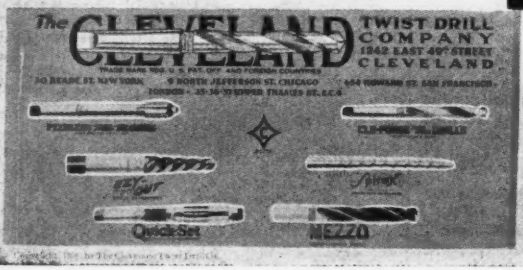

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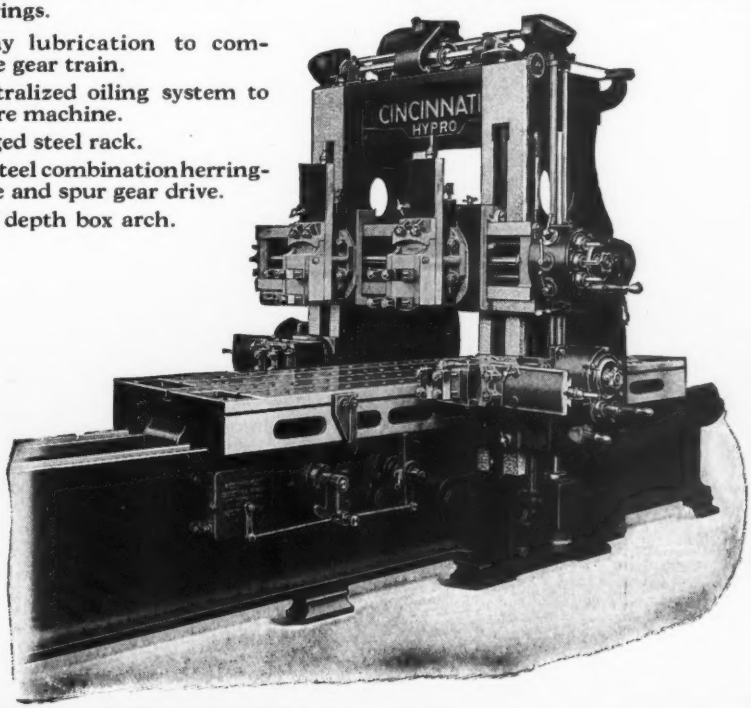

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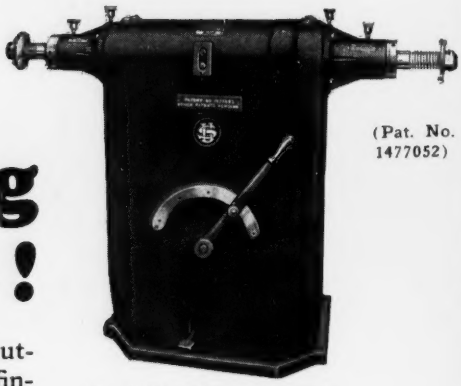

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Since we were unable to locate a
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